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"But I don't know your name," he protested.

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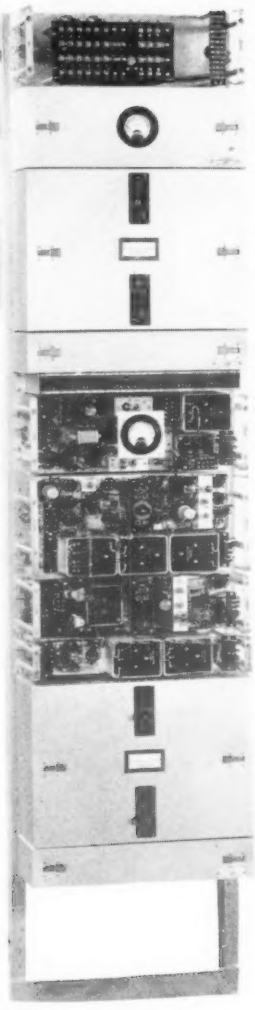
CARRIER SYSTEMS

By HAROLD B. McKAY



A complete three-channel carrier terminal with its principle parts identified. Channel 2 has dust covers removed showing internal apparatus. Photo, courtesy Lenkurt Electric Co.

FOREWORD

THE problem ever present in describing technical apparatus is in choosing the point at which to begin. The classical advice to start at the beginning is not applicable here, for the beginning would be in elementary physics and basic electricity.

Because this article is directed to telephone men who already have the knowledge and technical skill required to maintain circuits containing relays, the vacuum tube appears to be a good item with which to start. We who are in the fraternity of old-line telephone men already know electrical theory, can read circuit diagrams and can approach the usual equipment with a confidence born of a thorough concept of how the equipment works.

We approach circuits containing vacuum tubes with caution, however, perhaps because we cannot see them operate. A relay is either operated or not, and a glance tells which condition prevails, but a vacuum tube looks just the same when it is conducting current as when it is not.

Our brothers in the other branches of the electronic field sometimes jokingly call us "D. C. Electricians" or "two-wire men." This is not necessarily because we have not learned new circuits but perhaps because we have not "unlearned" many of our earlier concepts. Trouble in many electronic vacuum tube circuits can be located by the same means that telephone trouble shooters use. The same tools—a test receiver, a voltohmmeter, even the lowly buzzer are used by old-line radio men as well as telephone men.

However, before a telephone man can make an intelligent approach to vacuum tube equipment he has to discard some of his ideas of old reliable "facts" and take on new ones that seem quite indefinite at first approach.

The matter of "battery" and "ground" is a good example. In telephone work, battery is always battery, good old dependable 24 or 48 volts. If you found no battery, the circuit was open or the fuse blown—it was as simple as that. In electronic circuits, "battery" might be any one of a number of different voltages at different parts of the circuit.

Ground has always been good old Mother Earth. A grounded telephone line was definitely connected to the earth somewhere. In a vacuum tube circuit ground may be the earth, it may be the chassis of the equipment or it might be the cathode of a vacuum tube. But more of this later.

The scope of this article will include vacuum tube principles, suggestions for a new way of thinking about electrical circuit components, the actual parts and functions of carrier systems, and a guide to trouble shooting on this equipment.

Some of the explanations may appear over-simplified to those with an advanced electronic education and some of the comparisons may seem far-fetched. However, it is our object to develop a "concept" approach, or "manner of thinking" for those who have had no previous experience with this equipment. As a result, a good part of the material presented here will be more in the nature of a training text than an operating handbook.

* * * *

Part I—Vacuum Tubes

THE DEVICE that we call a vacuum tube was originally known as the "triode valve"; indeed, our friends the British still call it a valve. This word is more descriptive of the function than is "vacuum tube," for the device is simply an electrical valve.

Vacuum tubes consist of a glass or metal container which encloses several electrodes in a vacuum. The number of electrodes vary with the tube; those with two are called diodes, those with three, triodes and so on. We will be concerned here principally with the three element tube, the triode.

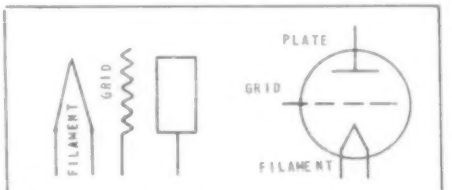


Fig. 1 - Actual construction of early type vacuum tube is shown on left. Drawing symbol is shown at right.

The three electrodes in the triode tube are called the filament, the grid and the plate. The first triode tubes made had an inverted "V" shaped filament, much like that in some electric lamps. Placed next to this was a mesh of fine wire, about the size of a postage stamp. This was called the grid. Next to the grid, a small rectangle of sheet metal was placed which was called the plate. Each of these units had connecting wires which led through the glass to the outside of the tube.

This original design is still followed in circuit diagrams, and the symbol for a vacuum tube looks very much like a picture of the first tubes ever made.

The purpose of the filament is to provide a source of electrons. Just what an electron is may be open to debate and there is nothing to be gained for our purpose in studying the structure of the atom. Electrons have been described as "particles" of negative electricity. This may seem vague, but it is sufficient to realize that an electron is "something" which carries a charge of negative electricity. When these electrons move through a vacuum or along a wire, electricity is flowing, and the more electrons moving, the more current flowing.

When a wire is heated in a vacuum, electrons are forced out of its surface. They are repelled away from the wire, but unless there is a positive charge around to attract them, they stay around the filament in sort of an invisible cloud. This is called a "space charge."

If the nearby plate is supplied with positive voltage from a battery which has its negative connected to the filament, current will flow from the hot filament through the vacuum to the plate. This is called the plate current, and it flows through a complete electrical circuit—from the negative pole of the battery, to the filament, across the vacuum, to the plate and back to the positive pole of the battery.

This current will be limited by any resistance that is in this circuit. Inside of the tube, the electron stream has resistance, but it is not constant. When a given amount of electrons flow across the tube, this increases the current; but as the current increases, the number of electrons increase in a vicious circle which would destroy the tube if some limiting device is not used. All vacuum, or gas-filled electrical devices, have this characteristic, which is called "negative" resistance. The word negative here bears no relation to the negative pole of the battery.

Arc-lights, fluorescent lamps, mercury vapor devices, rectifier tubes—all will draw increasing amounts of current if something doesn't limit them. Arcs use resistances; mercury and fluorescent lamps use a ballast, or choke coil. Triode vacuum tubes may have external resistance placed in the plate circuit, but more important, they have a grid.

The Grid

The placing of the grid in a vacuum tube was a basic discovery made by Dr. Lee DeForest a half century ago. From this tiny piece of screen, the whole vacuum tube art has grown.

The grid is closer to the filament than is the plate, therefore, it has greater influence upon the electrons at the point where they are generated. In typical operation on small vacuum tubes, the grid carries a negative charge of perhaps two or three volts, while the plate in the same tube may have 100 volts or more.

The grid, however, may be thought of as being something like Horatius at the bridge — "On yon strait path a thousand may well be stopped by three." Two or three volts on a grid may hold back and nullify the influence of a hundred volts or more on the plate.

In actual practice, if no voltage were on the grid, the current would flow from the filament to the plate without interference. But if a low voltage is applied to the grid it will reduce the current flow to the plate, and a slightly higher grid voltage will cut it off completely. This grid voltage is called the "Bias" voltage. The voltages and cut-off points for any given type of tube can be obtained from the manufacturer's tube handbooks.

This unique action makes the grid function as a valve; it "valves" or controls the amount of plate current. Of course, a switch or rheostat would do the same thing, but the big feature of the vacuum tube, is that a *small* voltage change on the grid will result in a *large* current charge in the plate. If there is a resistor or other kind of load in the external plate circuit, a large voltage change across the load will result from small changes of the grid voltage.

This is the amplifying principle of the vacuum tube. Under the conditions described above, a small voltage is amplified into a larger voltage. That is the basic operating principle of the tube itself, and in the circuits we will encounter, it can be assumed that the tubes will always work in this manner, and will have voltage similar to those mentioned above on its various electrodes. However, tubes may be used under conditions quite different than those mentioned here.

This basic method of operation described above can be utilized to make a vacuum tube perform as a rectifier or detector, a modulator or mixer and

REPRINTS AVAILABLE

This is the first of nine "down-to-earth" articles on "Carrier Systems." Mr. McKay, who authored the popular series on "Principles of Microwave Operation" (TELEPHONY, Oct. 31; Nov. 7 and 14, 1953) and other articles, has had long experience in all phases of communications engineering. He has been with the Pacific Telephone & Telegraph Co. since 1925. His past experience includes commercial, personnel and plant. Presently, he is working with toll, carrier and television systems in San Francisco.

Since 1920, Mr. McKay has been active in experimental radio operation and construction and manufacture of occasional custom-designed radio units. From 1945 to 1949 he held a radiotelephone operator's license and did pioneer experimental work on citizen's radio. His recent work has included specialty designed television receiving antenna installations. In addition to TELEPHONY, Mr. McKay has authored articles for leading radio, television and electronic publications. He is an associate member of American Institute of Electrical Engineers and Institute of Radio Engineers and a member

of Seismological Society of America.

The nine carrier articles will provide excellent training material for plant schools and, for that reason, TELEPHONY will reprint the articles under one cover following their publication, provided a sufficient volume of reprints are ordered to justify the cost of reprinting. Companies desiring reprints are asked to notify TELEPHONY as to the number they will need as soon as possible.

as an oscillator to generate alternating current. This is done by means of the different circuit components which may be hooked up outside of the tube.

It perhaps should be mentioned here that tubes have undergone considerable design changes since the original model was made. In some tubes, in order to reduce filament current and gain efficiency, the filament has been replaced with a heater-cathode assembly. This consists of a tightly wound spiral filament, which is then called the heater, surrounded by a little piece of tubing which is the cathode. The heater heats the cathode which in turn sends out the electrons. The cathode has a wire brought to the outside, and this, instead of the filament, becomes the point of negative return for the plate battery.

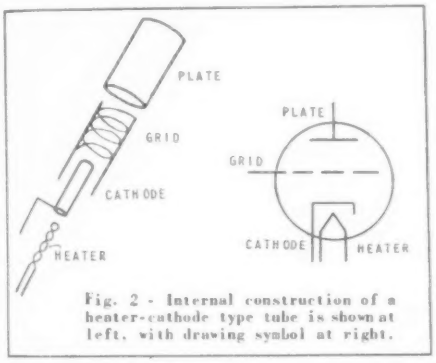


Fig. 2 - Internal construction of a heater-cathode type tube is shown at left, with drawing symbol at right.

The grid is no longer a flat screen as in the original model. It is cylindrical in shape, and surrounds the heater-cathode or filament. The plate is a metal tube which surrounds the grid.

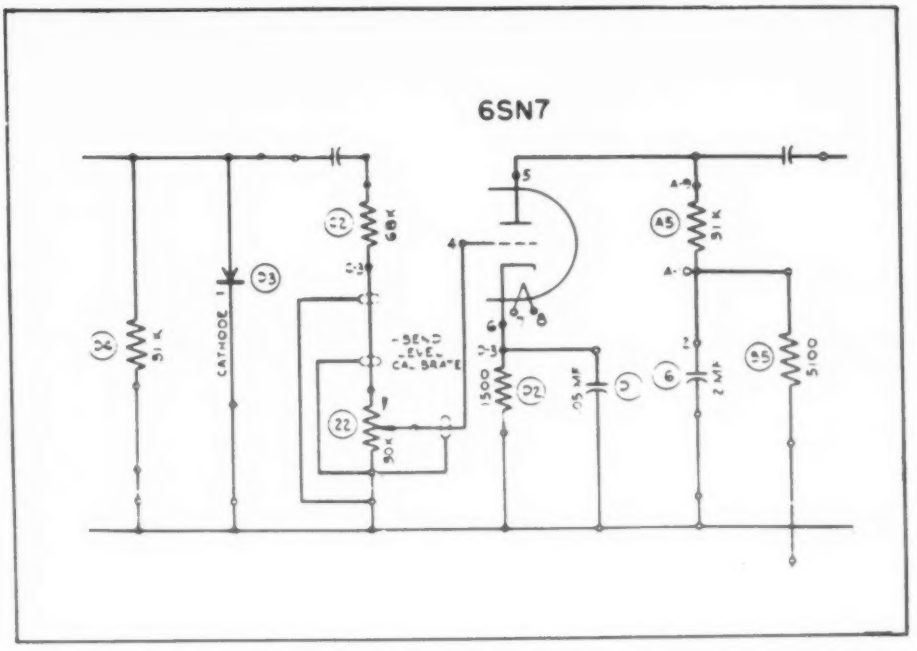
Ground

Before we can move on into applications of the vacuum tube we must start off on our new method of thinking about ground. The filament or cathode of a tube is the neutral point, or place of ground return as far as *that particular tube is concerned.* It may be connected to the chassis of the equipment; it may ultimately reach earth. But on the other hand it might not, depending on the circuit.

It is important, though, to remember that in measuring the voltage on the grid or plate of the tube, the reference point or "ground" as *far as this one tube* is concerned, is its own cathode. Some circuit drawings, particularly in radio equipment, may show voltages to ground, which is a handy thing. However, in order to understand the functions of the tube the cathode "neutral" point should be kept in mind.

Tube Experiment

A simple experiment can be conducted which will effectively illustrate just how a tube works. A single vacuum tube can be connected up to a battery or transformer to heat its filament. (The current used for the filament or heater is used for that purpose only, and has no bearing upon the other operations of the tube.)



This portion of a manufacturer's wiring diagram shows a vacuum tube connected as an amplifier. The small arrow in the second vertical line from the left is a single crystal. This serves as modulator for the carrier and voice frequencies in this system, which uses transmitted carrier.—From a Kellogg Switchboard & Supply Co. drawing.

In the plate circuit of the tube, connect a battery of about 45 volts which has taps at different voltages and a resistance and meter as shown in *Fig. 3.* In the grid circuit connect a couple of flashlight batteries shunted by a small potentiometer. Turning the potentiometer will enable you to apply a gradually changing voltage from zero to three volts on the grid of the tube.

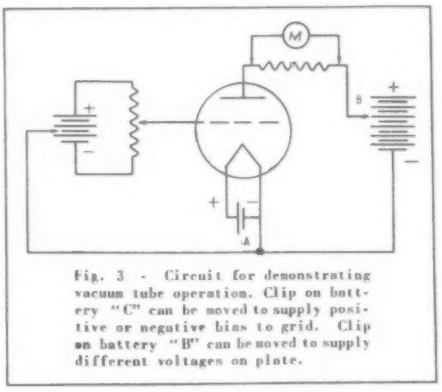


Fig. 3 - Circuit for demonstrating vacuum tube operation. Clip on battery "C" can be moved to supply positive or negative bias to grid. Clip on battery "B" can be moved to supply different voltages on plate.

Notice that changing the voltage taps on the plate battery will make small changes in the plate current, but changes of the grid voltage will make large changes in the plate current. This little circuit, incidentally, can serve as a miniature tube tester for future use. Note that if the grid voltage is raised high enough, the plate circuit will be cut off completely.

A significant principle of electronics is developed out of this experiment. If you were to draw a graph chart showing the relation between the grid voltage and the plate current, the line you would draw would not be straight, but curved in places. This is because the vacuum tube does not follow Ohm's law; that is, the plate current is not directly proportional to the grid voltage, over its full range.

If you make a graph for a simple resistance, the line would be straight instead of curved. That is because in the resistance, if the voltage is doubled the current doubles. Any device which produces a straight line on a graph chart is said to be *linear.* A device like a vacuum tube, whose characteristics result in a curve, are called *non-linear.* The curves for various tubes are shown in the tube handbooks.

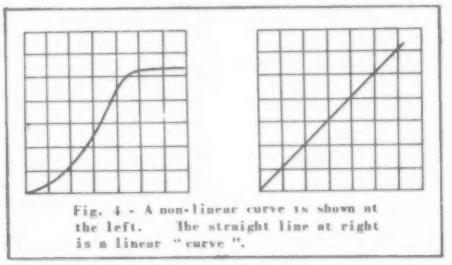


Fig. 4 - A non-linear curve is shown at the left. The straight line at right is a linear "curve".

Non-linear devices are extremely important in communications. These devices, which include crystals, copper oxide and rusty splices as well as vacuum tubes can perform many different functions, such as rectifying, oscillating, mixing frequencies and others.

Another important fact that develops from the above experiment is that a vacuum tube causes a "phase shift" or reversal of a signal passing through it. Normally in a circuit we expect the

current to go up when we raise the voltage, but it will be seen that when we raise the grid voltage on a tube the plate current goes down. This does not bother the signal going through the tube, but it is important in some circuits.

Resistance

Before we can move on to a simple practical application of the vacuum tube, such as its use as an amplifier, we must realign our thinking about certain electrical equipment. Radio and carrier circuits employ the same old parts—resistances, coils and condensers that we have always worked with, so there is really nothing new to learn in approaching this equipment. However, we must use a different method of thinking, and see these parts from a different viewpoint.

Resistances are used widely throughout the telephone plant. Usually we think of them as current-limiting devices. An example of this is the widely used switchboard cord circuit which uses a 12-volt lamp on a 24-volt battery, but has a series resistance to prevent the lamp from burning out. We can understand this simply by remembering that the resistance cuts down the current to the required value.

However, there is another way of looking at this situation. We may regard the resistor as a *voltage-dropping* rather than a *current-limiting* device. With this manner of thinking we see that 12 volts of the 24-volt battery supply is dropped by the resistor, leaving the remaining 12 to light the lamp.

Of course, in the case of the cord circuit, it does not matter which explanation is used. Either way of looking at it explains the operation of the circuit. When resistances are encountered in vacuum tube circuits, however, the way of thinking is most important. For instance, a resistor in a carrier circuit may be used solely for the voltage drop across it; the current which flows in it may have no function in the circuit. Indeed, many of the different voltages required in vacuum tube circuits are obtained by picking the voltage off of a resistor, rather than filling the equipment up with batteries of different voltages. This will be demonstrated when we discuss amplifiers.

Voice channels of this carrier are hinged and swing out, gate-fashion, for inspection, testing or maintenance. (Photo courtesy of Stromberg-Carlson Co.)

Resistors in radio may also be used as isolation devices, to prevent signals from flowing into unwanted paths and they may also be used as balancing or matching devices.

Actually, of course, a resistor always works in the same manner, no matter where it is used; it is our way of looking at it that helps our understanding of circuits. Every device carrying current has all of the factors in Ohm's Law—current, resistance and voltage. Every current carrying circuit has these conditions, and we must be careful not to look at a resistance as being so many ohms, and forget the current and voltage.

If a number of resistances were connected in series with current flowing in them, and if these resistances were concealed in a box with only the leads brought out, you could test these leads with a voltmeter and not be able to tell if there were batteries or resistances in the box; each would give a reading on the meter.

Amplifiers

The previous experiment demonstrated the basic voltage requirements of a vacuum tube, and showed how small changes in grid voltage produced large changes in plate current. The plate current changes thereby represented an amplified version of the changes of the grid voltage.

This feature of a tube can be used to amplify a signal, such as voice or music, if it can be put in on the grid, and taken out from the plate circuit. *Fig. 5* shows a simple diagram of what is called a resistance coupled amplifier.

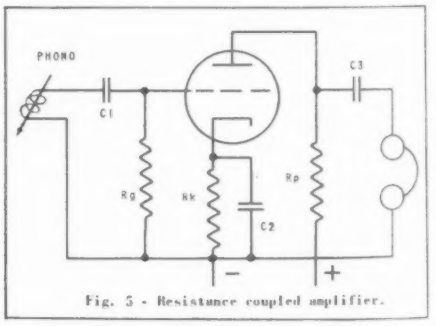


Fig. 5 - Resistance coupled amplifier.

Compare this drawing with the basic circuit described in the previous experiment. Note that the grid battery is missing, and some resistors have been added, a crystal phonograph pickup has been connected to provide a signal, and a pair of radio-type earphones have been added to hear the output.

Analysis of this little circuit will develop many of the important considerations in vacuum tube operation. *Cathode resistor*—the resistor marked RK is in series with the cathode of the tube. This means that all of the

(Please turn to page 44)

★ ★ ★ IN THE ★ ★ ★ NATION'S CAPITAL

by FRANCIS X. WELCH — WASHINGTON EDITOR

California commission's question as to utility's right to eliminate protests to rate increase criticized. NLRB sets up new policy exempting many businesses from its jurisdiction. President's proposed highway program spotlights need for federal policy for reimbursement of expenses to relocated utility facilities.

REFERENCE was made last week to the bare result of the California commission's decision allowing Pacific Telephone & Telegraph Co. an increase of 11.1 million dollars (approximately one-fifth of the company's request for $53,566,000 rate increase). Since that time your correspondent has had an opportunity to examine this important opinion, which comes to 95 typewritten pages. In the process, one very disturbing regulatory policy statement emerges.

The commission raises the question of whether a public utility has a right, or should seek, to dissuade or eliminate opposition protests in a rate case by means of personal contact before or during commission hearings. While such a policy has long been accepted as good public relations practice, it drew outright criticism from the California commission.

The California commission's opinion referred to the alleged visits by company officials "to certain individuals and groups for the purpose of discouraging appearances before the commission, even to the point of endeavoring to dissuade them from bringing their protests and problems to the commission." The company explained that it was trying to give such parties a better understanding of the facts. The commission opinion stated: "To interfere with a party or a witness in a proceeding before this commission is no different than such action would be before a court." The opinion added that the function of the commission was to provide a place where all utility customers "may come with their problems and protests."

The company claimed a constitutional right to send its representatives out to explain the reasons for a proposed rate increase to consumers, numerous groups, organizations, etc., who might be disposed to misunderstand or become dissatisfied without the full knowledge of the facts involved. But the California commission's decision gives rise to the serious question of what attendance at rate case hearings is supposed to accomplish.

Admittedly, a utility company would be engaged in very reprehensible activity if it attempted to dissuade the appearances of opposition parties and witnesses by deceptive or fraudulent means. But there was no question in this case (or in any other case in recent history of regulation, to this writer's knowledge) that the telephone company was trying to bamboozle anybody into staying away from the commission hearings or staying out of the case by means of bribes, threats, coercion, enticement, phony figures, etc.

What the company officials were doing, apparently, was to try to dissuade opposition which it felt was based on misunderstanding of the facts. One would think that a regulatory commission would welcome such activity. The attitude of the California commission on the other hand, would seem to encourage the building up of pressure for the purpose of *creating* as much protest and opposition as possible! There have been some well-known instances where such opposition has been built up on strictly synthetic foundations. If the commission is trying to encourage that sort of thing, it is really borrowing trouble.

Several years ago, this writer happened to be visiting the state capital of one of our large eastern states and saw a long line of people *picketing* the offices and hearing room of the state public service commission. Upon inquiry, he found out that the commission was holding hearings on a transit company's proposed fare increase. When he asked one of the commissioners about the pickets, the commissioner said: "Most of the people in that picket line are not even residents of the city where the streetcar company operates. There happens to be a labor union convention going on in this city right at this time. I guess they just feel that they need picketing exercise, because they don't seem to know what this case is all about."

More recently, this writer recalls an instance of a gas utility seeking a rate increase in which the company's representatives were able to convince several prospective opponents that they would not even be *affected* by the proposed increase even if it were granted! The particular parties had threatened to protest but did not realize that the rates for their class of service would not be changed. Surely, it is commendable for a utility to try to straighten out such an obvious and unnecessary misunderstanding.

In the District of Columbia it has long been the practice, and the accepted practice, for utility companies to send spokesmen to meetings of the various neighborhood citizens associations to explain company policy matters. This does not prevent these associations from opposing rate increases, which they often do. But it does give them a better understanding of the issues involved; so that if and when their protests are made, such protests are more intelligent and effective. Furthermore, it enables the various citizens groups to concentrate on one good, able presentation, instead of scattering their opposition in the form of numerous repetitious protests, cluttering up the commission's record and taking up a lot of time and expense for no good purpose.

It is this writer's considered opinion that the utility company has a *duty* to make an intelligent effort to explain the whys and wherefores of proposed rate change in advance of commission

proceedings. After the matters have been explained, certainly the utility should make no further effort to dissuade those customers who still want to protest, and the regulatory commission should give them a full and fair hearing. What's more, public attendance at hearings should be encouraged. In this way, the presentation of facts will be disseminated as widely as possible, and the issues better understood in the community. But it is something else again for the commission to encourage artificial pressures, built up for political or ideological purposes, by groups and interests which are sometimes not even concerned with the issues involved in the particular utility rate case. Certainly regulation by claque or organized demonstrations is not going to be conducive to fair or intelligent decisions in utility rate cases.

In 1950, the Capital Transit Co., which operates the streetcars and busses in the District of Columbia, spent a good deal of money running advertisements in the local newspapers explaining a necessary fare increase. Furthermore, the company sought out certain key leaders of community thought (public officials, newspaper editors, educators, clergy, business and professional leaders). These advance explanations were appreciated in almost every instance. When the company's case finally went to hearing, there was only one party appearing in opposition. And that was a communist affiliated outfit. Otherwise, the fare increase in that instance was generally accepted as necessary. The smart public relations activity of the company had paved the way and made easy the necessary, but unpleasant, task of the regulatory commission in issuing its subsequent order increasing fares. Could it honestly be said that this activity of the transit company was reprehensible?

It is hard to believe that the California commission will pursue the line of reasoning, adopted in the Pacific Telephone & Telegraph case, to illogical extremes. This writer prefers to think that the commission had in mind mainly a warning that the company should restrain its "missionary activity" to the extent that no questionable arguments or inaccurate presentation of facts were to be used. Since there was no question in this case about outright irregularities, such as the suppression of evidence or enticement of witnesses, it would seem regrettable that the precautionary statements of the commission in its opinion could not be made more clear.

On strictly legal grounds, the California commission's statement that "to interfere with a party or a witness in a proceeding before the commission is no different than such action would be for a court" challenges a doubt in the mind of this writer. The statement implies that such activity might be held in contempt of the commission.

True, the California commission is somewhat unique, among state regulatory agencies, in that it apparently has original power to punish for contempt, according to an old 1915 decision of the California Supreme Court (Pacific Telephone & Telegraph Co. *v.* Eshelman, 137 PAC 1119). But it is hardly likely that the court would sustain such contempt action against a utility simply engaged, in good faith, in seeking to minimize its rate case opposition by informal explanation of the facts involved to individuals, whether parties or not. The old California Railroad Commission was rebuked for an attempt to use its contempt powers in an unreasonable manner by the same California Supreme Court in a 1922 decision (Van Hoosear *v.* Commission, PUR1932A 307).

Most commissions do not even have original contempt powers. In a somewhat analogous 1931 case before the New York Department of Public Service (Re Brooklyn Bus Corp., PUR-1931E 52), the commission said: "Applicant asserts that it was led to refrain from making its objection at the original hearing through the fraud of the Brooklyn Bus Corp. The commission has no jurisdiction to pass upon the claim of fraud as such."

Exemptions from Taft-Hartley

The National Labor Relations Board on July 14 completed the job of setting up new policy rules removing itself as the judge of labor disputes involving thousands of smaller business establishments all over the country. This latest step goes even further than the exemption previously noted in this department. Indeed, the new rules would appear to exempt (among many other thousands of business establishments) all but a handful of the very largest Independent telephone companies from the application of the Taft-Hartley Act. In a word, *the NLRB now rules that it will no longer take cases involving only utility companies doing a gross business of less than 3 million dollars a year!*

The new jurisdictional standards will govern board decisions on whether to handle or to pass up labor dispute cases involving retail stores, utilities, radio and television stations, transit systems, certain types of interstate firms, industrial service companies and firms engaged in national defense work. The new standards will be applied to pending as well as future cases.

Establishment of the new standards, the most far-reaching action taken by the labor board since it came under Republican control last May, resulted from a series of split decisions in individual dispute cases. At least one of the two Truman-appointed holdovers on the five-man board dissented in each case.

The quasi judicial agency hears unfair labor practice charges and conducts union representation elections under Taft-Hartley. It has discretion to decide in which cases of those affecting commerce it will exercise jurisdiction. Aggrieved parties whose case the board refuses to handle may seek relief under state labor laws.

The new standards for each industry are generally as follows:

National Defense. To come under NLRB jurisdiction, a defense industry must supply at least $100,000 a year in goods or services under government contracts relating directly to the national defense. Formerly, the board took jurisdiction of any company doing work "affecting" national defense.

Newspapers, Radio and TV Stations. The board will assert jurisdiction over newspapers if their gross revenue is at least $500,000 a year, and over radio and TV stations if their gross revenue is at least $200,000. Formerly, it handled the cases of any stations or newspapers whose operations affected interstate commerce.

Retail Stores. The board set minimum limits for the amount of buying a store does if it operates entirely within one state, and on the buying and selling it does if it is part of a multistate chain. The new minimums are higher than the old ones.

Utility Companies and State Public Transit Systems. The board will assert jurisdiction if the company does a gross business of at least 3 million dollars per year. It will take jurisdiction of interstate transit systems if their gross revenue from interstate operations is at least $100,000 a year. Formerly, the board took all utility and transit systems cases when the operations affected interstate commerce.

The board also set new standards for multistate businesses other than retail and service industries, and for companies which supply services to interstate companies.

Need for New Relocation Policy

President Eisenhower's bold proposal —through Vice President Nixon—to the Governors Conference for a 50 billion dollar highway program is something for all the public utilities in the country to think about.

Without going into the details of the Eisenhower program, or its reception by the assembled state governors, the very idea that such a colossal amount might be spent on highway construc-

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THE PLANT MAN'S Notebook

by Ray Blain, Technical Editor

ON OUR LAST trip to Alaska, we left Washington, D. C., on a sunshiny day in June, about noon. The sun didn't last long, however, for after our American Airlines DC-6 passed over the Blue Ridge Mountains of Virginia, we encountered stormy weather. The pilot tried to go over the storm, but he could not so he went down low and passed under most of it. We made an instrument landing in Chicago and there we boarded a Northwest Airlines "Stratocruiser" for Seattle. We had a smooth flight over the clouds, but did not see the ground during the entire trip.

The next morning, we boarded a Pan American DC-6B and after an uneventful flight of a little more than three hours we landed at Annette Island. This is the transfer point for Ketchikan and here we boarded an Ellis Air Lines Gruman (Goose) Amphibian twin-engined plane for a 20-minute ride into town. Ketchikan is built along the mountain side at the water's edge so there is not sufficient room for a landing strip. We landed on the water and taxied to the float at the shore. After spending a day at this fisherman's paradise (not fishing but checking communication facilities), we started the next leg of our northward journey.

We left Ketchikan in a small single-engined float plane and headed north over the submarine cable route of the Alaska Communication's System. We inspected two cable landings from the air and landed on the water near where the Cable Ship "Lenoir" was working and had lunch with the crew. Later in the day we boarded the float plane again and, after a stop at Petersburg, we proceeded to Juneau where we arrived in the early evening.

Here again we spent a day with communicators in Alaska's capital city. We also had time to have a look at the famous, but now inactive, Alaska-Juneau gold mine. We also had a look and snapped some pictures of the Mendenhall Glacier, which is a sight long to be remembered. Again, we did not have time to do any fishing, but we had a talk with a boy who was unloading four salmon from his small boat, each weighing more than 40 pounds.

On the next leg of our journey we headed north on a float plane of the Alaska Coastal Airways, first making a short stop at Haines and then up the Lynn Canal to Skagway. The airstrip here is located in the valley along the side of a river. When the wind is coming down the valley the pilot must head into the canyon, turn and make his landing. The wind was coming from the wrong direction the day we landed so we experienced the thrill of this sharp turn. The pilot throttled one engine, gave the other full speed ahead with hard rudder and we made the tightest turn possible. This was most necessary as space did not permit a wider turn. We understand, too, that it is perfectly safe. Skagway was the port where the Klondike gold seekers landed in 1898.

After spending a night in a hotel that has changed very little during a half century, we started out over the White Pass and Yukon Railroad for Whitehorse, Yukon Territory. This is a trip we shall never forget and it is no exaggeration to state that probably nowhere else is there a 110-mile trip by rail more interesting or thrilling than from Skagway over the summit of the once-dreaded White Pass, and certainly nowhere else will there be found scenery more rugged or more awe-inspiring. There are still remaining numerous traces of the old gold rush trail that may be seen from the train.

We spent a night in Whitehorse (Capital of Yukon) and then boarded a Pan-American plane for Fairbanks. This far-north city has 90 days of almost continuous sunlight during the summer. While we were there, the sun went out of sight a short time about midnight, but it did not get dark. Actually, we took pictures at midnight by natural light. Here, in addition to conferring with communicators, we found time to make a short visit to the University of Alaska and a nearby gold dredge. The Alaska Communications System operates a new 3-CL toll board in Fairbanks which was recently installed in a new and modern building.

We took a side trip from Fairbanks on Wien Alaska Airlines, Inc., to Circle and Ft. Yukon, above the Arctic Circle. On this trip, we rode a single-engined land plane, a Canadian-built "Norseman," that appeared to be efficient and safe. This airline operates in the northern and most rugged part of Alaska and has a modern, efficient, and up-to-date communications system. We know because we talked over several of its radio-telephone channels. This flight over the Arctic tundra proved most interesting and unusual. We sighted moose on several occasions and "shot" at them with our cameras.

After two days in Fairbanks we left by car down the Alcan Highway to Northway and then to Tok Junction over the Glenn Highway to Anchorage. We followed the open wire carrier telephone line that was installed over this route a few years ago and is presently operated by the Alaska Communications System. This line was well constructed and is giving good service with a minimum of trouble.

We spent several days in Anchorage conferring with communicators. Here, also, the Alaska Communications System has a new 3-CL toll switchboard installation in a new, modern building that will be cut into service in the very near future.

We also made an interesting trip from Anchorage to the Port of Whittier and return with Frank W. Shellhorn, superintendent of communications for the Alaska Railroad. This trip was made in a DeSoto sedan which is equipped with flange wheels and runs on the rails. It seems awkward to drive a car without a steering wheel, but equipped with all of the other conventional controls. Mr. Shellhorn informed us that the railroad recently conducted an experiment of spraying a section of

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The OPERATOR'S CORNER

by MAYME WORKMAN, Traffic Editor

ANNIVERSARIES are important occasions in the telephone industry and are frequently recognized by telephone companies and workers. As in marriage, the first year is probably the hardest since this is the period of adjustment.

However, Laurel Jane Teach, operator in the Champaign Telephone Co., Urbana, O., exchange, had many nice things to say on celebrating her "First Anniversary" in the telephone industry. "It is a good job," said Miss Teach, and "I'm glad I became a 'Hello Girl!'"

Anniversaries are occasions for remembrance, a recollection of achievements, joys and sorrows. Pioneers in the telephone industry in particular have so many things to remember, from their first anniversary to their 15th, 20th, 25th, and on to their golden anniversary.

It is their joy to meet with their fellow Pioneers and talk about the "good old days" in the industry, when things were done the hard way. But it didn't seem hard to them at the time. They were just as zealous in their desire to do a good job and to please the customer as telephone folk of today.

It is proper and fitting that recognition should be given to service anniversaries. How sad to have an employe complete perhaps 25 years of faithful service in the industry with no word of comment, no glad hand, no kind word of recognition or appreciation for the service rendered!

It is true, the employe was paid for the service rendered but no doubt there were many times in those 25 years when he or she rendered service beyond the call of duty, not for monetary reward, but for the sheer joy of being of service to one's fellowman. Sometimes the things that cost little or nothing, such as a word of commendation or appreciation, are the most valued by the recipient.

Wouldn't it be wonderful if every telephone company throughout the nation would give recognition to service anniversaries! What a good feeling it would create. It is true, many people engaged in the telephone industry have long service records, and some are loathe to leave at retirement time. But perhaps we would have even a greater number of long-service record employes if the practice of giving recognition to service anniversaries were observed throughout the industry.

In the Independent telephone industry, we have an organization known as "The Independent Telephone Pioneer Association." Its purpose is to preserve the history, traditions and ideals of Independent telephony; to promote and perpetuate fellowship and friendliness; to encourage the development of the art and industry, and all worthy related objects.

This organization, comprised of more than 4,000 men and women throughout the nation, Central and South America, Hawaii, Canada, and many other countries, gives recognition to telephone folk who have been engaged in the telephone industry 15 years and longer.

The association has a fitting emblem with years of service engraved in the center—15-20-25-30-35-40-45 and 50. Many companies present a Pioneer service emblem to their employes when they have a service anniversary. The service emblems may be worn by any member of the Independent Telephone Pioneer Association.

Industry service anniversaries, like personal anniversaries, are milestones of achievement; occasions for joy and

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THE FIRST ANNIVERSARY

It has been about a year since I was hired as a long distance operator in an Independent telephone office. I had never seen a switchboard before, much less knew how to operate one.

However, my fears were all allayed under the efficient guidance and sympathy of my chief operator. Two other girls took their training with me, and in less than two weeks we began to "work the board."

How nice it is to take calls from people who treat you like a human being—and yet what a good feeling comes when you have handled a difficult subscriber well. There is no better place to learn self control than at a switchboard.

Our switchboard is small, having only eight positions but we oftentimes have as many as 1,200-1,300 calls in a day.

It didn't take long to learn the regular "voices" and to automatically put their number on the ticket when they place a call. The lovely voice of the secretary of the paper mill, the gruff voice from the stockyard, the impatient voice of the junk man—the operator knows them all.

Many changes have taken place in my first year as an operator. Several girls have left to be married, new ones have arrived and we lost through death our one "southern voice."

More cities have "gone dial," codes have been changed, and we now handle the long distance calls from a nearby exchange to our tributaries.

All of the constant change keeps the operator on her toes besides adding the stimulus of variety to her job. And it is a good job! I'm glad I became a "hello girl."

—By LAUREL JANE TEACH

Glossary of Telephone Words and Terms

AUTHOR'S NOTE: This glossary comprises a list of words and terms which telephone company personnel encounter in their everyday work. Some of these terms may be completely unfamiliar to the new employe while other terms, seemingly familiar, will be found to have a special meaning peculiar to the telephone business. The definitions herein, while not always rigidly scientific, are as exact as practicable, considering the desirability of keeping them both short and simple. Slang terms were avoided where there was an alternate preferred expression. It is hoped that this glossary will be helpful to all telephone personnel, but more especially to those who are relatively new in the business.

Compiled by EMERSON C. SMITH

THIS IS the fourth installment of "Glossary of Telephone Terms." The first, second and third parts were published in the July 3, 10 and 17 issues. Reprints of the complete glossary will be available, provided a sufficient volume is ordered to justify reprinting. It is urged that all orders be sent to TELEPHONY immediately.

Q

Quad. Group of four wires composed of two pairs twisted together. The pairs have a fairly long length of twist and the quad a relatively short length of twist.

Quality. (1) Usual meaning; (2) in transmission the degree of distortion of sounds from their true value.

R

Rack. Structure, such as vertical beams, on which units of apparatus are mounted.

Rack, Cable. Structure on which cables, cloth or lead covered, may be hung.

Radio. Properly, communication by high frequency electrical waves in space. Commonly used to describe work and operations concerned in handling program material designed for radio transmission.

Radio, Beam. Radio transmission along a very narrow selected path.

Radio, Highway. Radio transmission directed along the path of a highway.

Radio, Microwave. Radio using very short waves (30 C.M. or less) because of their special properties.

Radio, Urban Mobile. Telephone communication within any exchange limit using a radio path to the central office.

Rail, Piling. Support in the bottom of a panel on which jack strips are laid or piled.

Raking. Placing a pole out of vertical line at a corner away from the direction of pull to strengthen the line.

Reactance. That part of the impedance of an electrical circuit which is due only to inductance, or capacity, or both.

Recall. Signal to an operator to return a circuit.

Receiver. Telephone receiver is a device which transforms a varying electrical current into sound waves.

Receiver, Land. In radio communication with automobiles, a fixed radio receiver which collects energy sent from the cars.

Receiver, Mobile. In radio communication with automobiles, the radio receiver in the car.

Receiving Amplifier. Amplifier employed to raise the signal level at the receiving end of a system.

Receiving Equipment. That equipment, amplifier, filters, oscillator, demodulator, etc., associated with incoming signals.

Rectifier. Electrical device for converting alternating current to direct current. Not a rotary machine.

Reflection Loss. Apparent transmission loss of a line which results from a portion of the energy being reflected back toward the source, due to a discontinuity in the transmission line.

Regeneration. Gain in power which results from coupling from a high level point to a lower level point in an amplifier or a system which encloses devices having a power level gain.

Regulator, Pressure Testing. Device for adjusting the rate of gas flow into a cable from a gas tank at high pressure.

Relay. Magnetic device which moves an armature which in turn operates spring contacts to control current flow.

Relay, Cut-off. In a subscriber's line circuit, the relay which operates on an incoming call to disconnect the equipment for making outgoing calls.

Relay, Differential. Relay with two windings which assist or oppose each other in moving the armature.

Relay, Line. (1) Relay in a subscriber's line which operates on his calling-in signal; (2) in telegraphy, a relay in series with the telegraph line which controls the operation of his sounder.

Relay, Polar. Relay in which the movement of the armature depends on the direction of the current flow.

Relay, Supervisory. Relay operating from the current supplied to the subscriber for talking which controls the operators or switching mechanism handling his connection.

Repeater (Pulse). In dial signaling, a device which receives dial impulses from one circuit and repeats them into another.

Repeater (Telegraphy). Device which receives telegraph signals from one circuit and re-transmits them into another.

Repeater (Telephone). Device employing vacuum tubes which receives voice energy from one circuit and sends them without added distortion at a higher level into another circuit.

Repeater, Battery & Ground Pulsing. Pulse repeater which pulses from battery to ground on each side of the line but in opposite directions.

Repeater, Digit Sending. Pulse repeater which, when accessed from the toll level, sends one pulse to kick up the incoming first selector to the first level which in turn is tied to the toll level.

Repeater, Four-Wire. Telephone repeater operating in a circuit which transmits in one direction on one pair of wires and in the other on another pair.

Repeater, Pulse Correcting. Pulse repeater which delivers standard pulses even though the pulses received are badly distorted by line or trunk conditions.

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Repeater—22 Type. Repeater with a separate amplifier element for each direction used in a two-wire circuit.

Repeater—V Type. General purpose feed-back type repeater. The amplifying elements are separate from the associated coils.

Reperforator. Device in teletypewriter service which punches a tape for resending from received signals.

Resistance. (1) Characteristic of a conductor or circuit which restricts the flow of current; (2) element designed to offer a predetermined restriction to current flow.

Resistance Coupling. That method of interconnection between stages in an amplifier which connects the plate of one tube to the grid of the following tube by means of a resistor.

Resonance. Condition of being in tune. Oscillating or vibrating at a particular frequency. In electrical circuits, resonance occurs when the inductive and capacitive reactances are equal.

Return Loss. Loss between two paths on a transmission line or in repeater or terminal equipment. A measurement of return loss will indicate the degree of balance between the line and network of a hybrid. A measure of the gain that can be introduced into a system before singing will occur.

Return, Negative. Drainage wire between two points to equalize potential differences for control of electrolysis.

Reversal. Changing the direction of transmission or polarity.

Reverting Call. Call to another party on the same telephone line.

Rheostat. Adjustable device for regulating current.

Ribbon, Bonding. Tinned copper strap used for permanently grounding and interconnecting cables.

Right-of-Way (R/W). Land occupied by telephone plant but not owned by the company. An easement to use land and have access to it.

Ring. (1) Audible signal; (2) second conductor of a pair; (3) of a plug, the circular conductor back of and insulated from the tip.

Ring, Bridle. Ring on poles for collecting bridle or cross-connection wires together or to change their direction.

Ring, Cable. Loop of wire or strap steel around a cable and hooked to the strand to suspend the cable.

Ring Cut. Injury to a cable sheath caused by rubbing from a cable ring.

Ring Down. Circuit signaling where a signal is brought in by ringing current.

Ring, Drive. Nail-like fastening with an open loop at upper end, driven into poles to hold drop or other wires.

Ring, Jumper. Loop of insulated steel through which cross-connections are passed to secure them.

Ringer. (1) Subscriber's bell; (2) repeating device which receives current of one frequency and sends another frequency to the next circuit, or the two sides may be alternating and direct current.

Ringing. (1) Signaling; (2) applying cable rings to a strand.

Ringing, Code. Calling subscribers selectively by a series of rings.

Ripple. Periodic fluctuation on a dc voltage which results from incomplete filtering in a power rectifier set, or from the bars of the commutator of a dc generating machine. The magnitude of ripple is commonly expressed as the ratio of its effective value to the average value to the total dc voltage, in per cent.

RMS Amplitude (Root-Mean-Square). That amplitude of an ac wave which may be used for an accurate computation of power in watts. In communication particularly, with complex waves involved, the RMS amplitude of a current is said to be that current which is computed from a measurement of power dissipated in a known resistance as a result of that current.

Rod, Ground. Steel rod driven into the earth to make an electrical contact with the earth.

Roof. Top of a pole cut at an angle to shed water.

Rotary Dial System. Method of dialing into a register which controls the operation of power driven rotary-type switches to complete the call.

R.O.T.S. See **"Switch, Out-Trunk."**

Route. Path of a pole line.

ORDER YOUR REPRINTS NOW!

Reprints of the completed "Glossary of Telephone Terms" will be available following its publication in TELEPHONY (last installment to appear in July 31 issue), *provided sufficient orders are received to justify reprinting.* Companies desiring reprints for their employes are asked to inform TELEPHONY the quantity they will need as early as possible.

Route, Toll. Consecutive paths occupied by a pole line carrying toll circuits.

Rule, Guy. Circular, sliding set of scales for computing the values and dimensions of guys in various circumstances.

Rule, Pressure Testing. Circular, sliding set of scales for making computations relating to gas pressure operation.

Run, Cable. Path occupied by a cable.

S

Sag. Downward drooping due to weight. The vertical distance from the lowest point measured from a straight line joining the points of support.

Satellite Office. Dial central office which has trunks to only one other office. Often a switching-selector-repeater office.

Schedule. (1) In program service, a description of the frequency transmission characteristics; (2) a table of hours of work for each employe in a group or the working hours for a single employe; (3) usual meaning.

S.D. See **"Drawing."**

Screwdriver, Plug. Jeweler's screwdriver having a retractile pin concentric with the screwdriver blade. Used for holding and driving the small screws in telephone plugs.

Secondary. (1) Coil in a transformer in which the flow of current is due to inductive coupling with another coil ("Primary"); (2) low voltage conductors of a power distributing system. Caution; "Low" is relative, secondaries may be charged at 2,300 volts.

Section. Length of cable between two load points, or between any two specified points.

Section, Building Out. Capacity added to a cable pair or circuit element to raise its capacity to a desired value.

Selector. Switching mechanism actuated by incoming pulses to select a group of trunks after which it hunts and connects to an idle trunk in the group.

Selector, Digit Absorbing. Dial selector switch arranged to step up and then fall back down on the first one or two digits of the total number of digits dialed. It then cuts-in on the next digit dialed.

Selector, Gill. Slow-acting telegraph sender and calling key for selective signaling.

Selenium Rectifier. Rectifier formed of discs of iron in contact with a layer of metallic selenium.

Sender. Sender (or register or director) receives pulses from a dial and controls the subsequent operations required to complete the connection.

Sending Filter. Filter employed at the transmitting terminal.

Separation Filter. Combination of filters used to separate one band of frequencies from another. Often used to separate carrier and voice frequencies for transmission over individual paths.

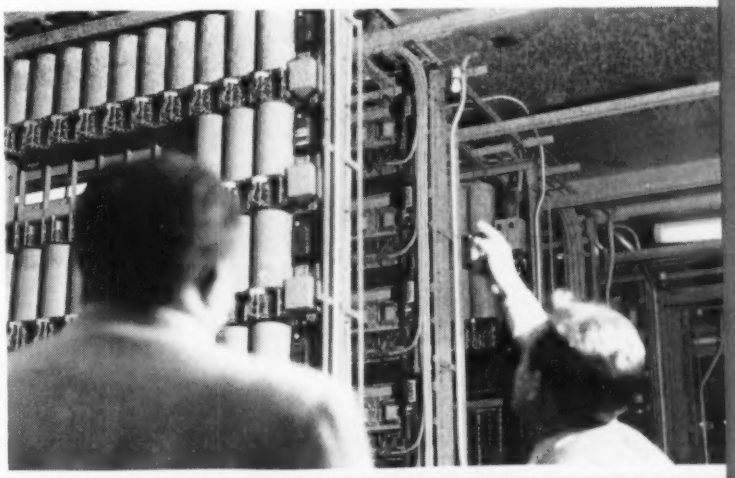
Series. Elements in an electrical circuit are connected in series when the same current flows through them.

Series Resonance. That resonance exhibited by a capacitor and an inductor connected in series, characterized by low series attenuation at the resonant or tuned frequency and high series attenuation at all others.

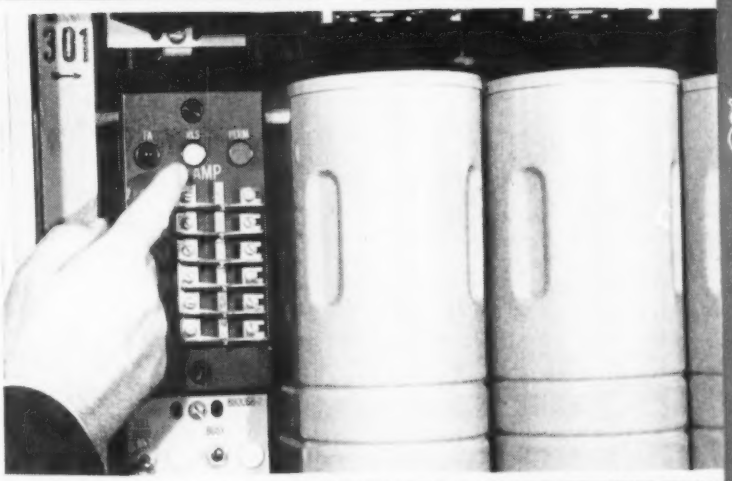
Service. Use of the property of the telephone company so that it properly serves the user's communication needs.

(Please turn to page 30)

Come with us as we visit a Strowger Automatic exchange. See for yourself how a typical corrective maintenance procedure progresses by swift, logical steps that save time, money, and make things right in a hurry:

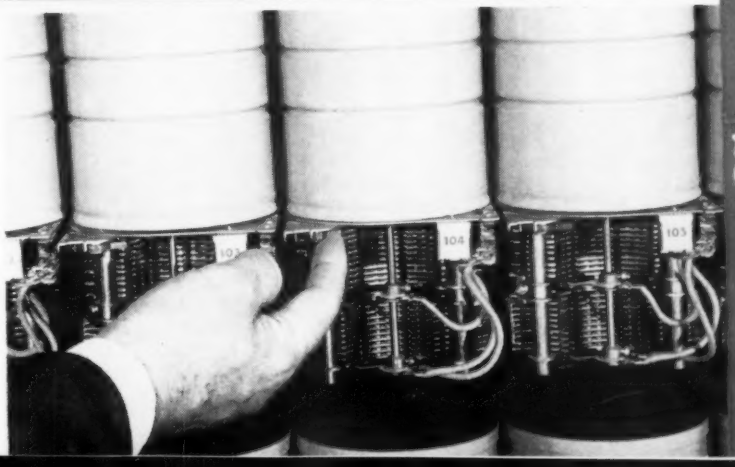


1. "Let's say a selector has not released to normal. A red lamp indicates the bay in which the affected switch is located."



2. "Another lamp indicates the shelf on which the affected switch is mounted. This switch must be one of those that is up."

3. "Listen at each 'up' switch with a test handset to find which is cut in on an idle circuit. Dialing indicates the specific nature of the trouble."



4. "Merely flip the red key to busy-out the affected switch so traffic will flow smoothly without interference. You can attend to this switch now—or later, if that is more convenient."

Service, Extended Area. Exchange service without toll charges, which extends over an area where there is a community of interest, in return for a somewhat higher exchange service rate.

Service, Full Period. Telephone channel furnished for a subscriber's private use at any and all times.

Service, House. Work required to keep a building in operating condition.

Service, Measured. Subscriber's telephone service in which a subscriber's calls are counted automatically and a charge made based on their number.

Service, Private Line. Channels furnished a subscriber for his personal use without switching.

Set. Assembly of electrical apparatus, the parts of which operate together. Usually in a common case or cover.

Set, Combination. Telephone set in which all the equipment except the transmitter and receiver is in one case.

Set, Common Battery. Subscriber's set designed to operate from the battery in the central office.

Set, Composite. Assembly of equipment for deriving two direct current telegraph circuits from one two-wire telephone circuit without mutual interference.

Set, Cradle. Telephone set in which the transmitter and receiver is in a single piece and this is held, when not in use, in a double fork called a "cradle."

Set, Hand. Receiver and transmitter mounted on a single frame. The term includes no other equipment.

Set, Lineman's Test. Telephone set complete with local battery used for talking and some simple tests.

Set, Operator's Telephone. Transmitter and receiver assembly worn on the head and shoulders by telephone operators and testboardmen. It connects by a cord and plug to an "operator's telephone circuit."

Sheath. Usually the outer lead covering of a cable.

Sheet, Cut. Order to change connections describing what work is to be done.

Shock, Acoustic. Physical pain, dizziness and sometimes nausea caused from hearing loud sudden sound.

Shoe. Spring device designed to make contact with the springs of a protector assembly or punchings of one circuit on a connecting block.

Shoe, Reversing. Device usually used at protectors to turn the "tip" and "ring" of a line over.

Short. Connection of two conductors of a circuit through a very low resistance.

Side Circuit or "Side." Two-wire circuit forming one part or "side" of a phantom circuit.

Side, Field. Side of a pole line away from the highway.

Side, Road. Side of a pole line towards the highway.

Sidetone. Sound of the voice of a speaker transferred to his receiver from his transmitter.

Signal. Device, audible, visual or both for giving a call for attention.

Signal, Busy (1) Signal showing that a circuit is in use; (2) audible signal to a calling party showing that the line he has called is in use.

Signal, Recall. See **Recall.**

Signaling—20, 135, or 1,000 Cycles. Signaling systems using current alternating at the rate of 20, 135, or 1,000 times per second.

Simplex. Telegraph or signaling circuit derived from a two-wire circuit without interference to the two-wire circuit. A phantom may also be simplexed.

Singing. Undesired state of oscillation in a circuit equipped with telephone repeaters due to unbalance of the hybrid coil terminations.

Singing Point. That amount of total gain in a transmission system (most commonly used in connection with two-wire repeaters) which causes the system to begin to lose efficiency of performance because the self-oscillating point is too closely approached.

Skinner. Wire brought out at the end of a cable prepared for soldering to a terminal.

Slack. Excess length of cable, messenger or wire between two supports which permits sag to be too great.

Sleeve. (1) Lead tube placed over spliced conductors in a cable; (2) third wire associated with a pair which connects to the tubular part of a jack or cylindrical part of a plug; (3) tube of woven cotton (cotton sleeves) pushed over a twisted wire joint in cable conductors; (4) brass or copper tube or paired tubes used to fasten line or drop wires together by twisting, crimping, or rolling; (5) tube of copper or iron pushed over a relay winding to make it slow acting; (6) usual meaning of a tube fitting over.

Sling, Rope. Set of ropes and snap fasteners used like a safety belt when working in trees.

Snips. Scissors used by a cable splicer.

Solder, Hard. Alloy of lead and tin with a larger portion of tin forming a strong joint.

Solder, Rosin Core. Solder in tubular form, the center filled with rosin and, therefore, self fluxing.

Solder, Soft. Solder with a high lead content.

Solder, Wiping. Solder used by splicers in joining a lead sleeve to a cable sheath.

Solenoid. Tubular coil of wire which, when traversed by an electric current, will act as a magnet and tend to pull a movable iron core to a central position.

Sounder. Electromagnetic device which operates from telegraph impulses to give audible signals which a trained listener can interpret.

Space. (1) In telegraphy, the signal condition opposite to "mark"; (2) in simple telegraphy, the "line open" condition.

Spacing. (1) Interval between load coils which is most effective for a particular purpose; (2) distance between telephone repeaters which permits energy levels to be sustained.

Span. Length of cable, wire or suspension strand between two poles or other fixed supports.

Spare. Available or can be made available and not in use.

Specifications. See **"Practices."**

Speech-Only. In program transmission, a channel good enough for voice transmission but not good enough for music.

Splice. In cable work, joining two or more cables together, securing continuity for all pairs and covering the point of junction with a continuous sheath.

Splice, Duct. Slender splice in the duct between two manholes.

Splice, Final Test. In splicing quadded cable, the splice where the quad capacitance unbalances (phantom-to-side and side-to-side) are adjusted to a satisfactorily low value for the loading section, either by matching unbalances of opposite sign which will neutralize or by splicing in "balancing units."

Splice, Random. In splicing cable, a splice where pairs from the two ends are spliced, within each color group, without regard for their theoretical count, and even with deliberate mixing.

Splice, Rotation: Cable splice in which pairs are joined without testing by going around the core from a marker and picking up pairs in sequence.

Splice, Semi-Final Test. One of a pair of splices, at the one-quarter and three-quarters points of the loading section, where the quad capacitance unbalances are neutralized or "built" for neutralization at the final test splice.

Splice, Tag. Cable splice in which each pair in each direction is identified and tagged with its number and pairs then spliced to mates.

Splice, "Y." Two cables in one direction spliced to one in the other.

Splicing Chamber. Compartment whose removable cover is the floor beside the main distributing frame, in which the tip cables can be spliced to the entering cables. Used in offices which are too small for a cable vault, or where the distributing frame is several floors above the cable vault.

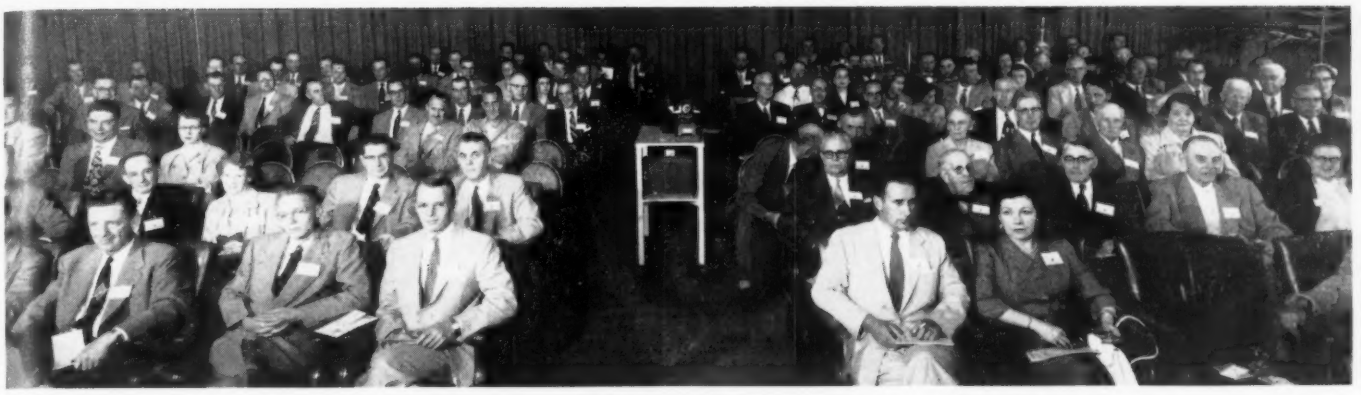
Spring. Resilient flat piece of metal forming, or supporting, a contact member in a jack or a key.

Spurs: See **"Climbers."**

Stand, Desk. Telephone instrument consisting of a base supporting a column which in turn supports the transmitter. A hook on the column holds the receiver when not in use.

Start-Stop. System of teletypewriter operation whereby

(Please turn to page 40)



Scene at opening session of Oregon-Washington Independent Telephone Associations' convention.

Oregon-Washington Joint Meeting

NEARLY 500 representatives of telephone operating and manufacturing companies attended the joint convention of the Oregon and Washington Independent Telephone Associations at the Multnomah Hotel in Portland, Ore. on June 18 and 19.

The following resolutions were passed by both associations:

(1) Calling for inclusion in REA contracts of adequate provision for compensation to telephone companies for any expense incurred in relocation or metallicization of telephone lines made necessary by power line operations.

(2) Calling for study and revision designed to give relief to public utilities for costs incurred as a result of public authority requiring the moving of their facilities on public rights-of-way when roadways are widened or relocated.

(3) Calling for legal regulation—by the regulatory body of the state in which they are located—of all operating telephone units either privately owned companies, cooperatives, mutuals or non-profit, to the end that uniformly good and acceptable standards of construction should apply to every operating telephone concern alike.

(4) Calling for the complete elimination of excise taxes in regard to the telephone industry or, alternatively, such action as will distribute the financial burden equitably upon other utilities which are not now required to pay an excise tax.

(5) Protesting the interference with telephone communications caused by direct radiation from the U.S. Naval radio station transmitter NLK located near Arlington, Wash., and calling for a policy which would adequately compensate those whose operations are adversely affected by the construction of such powerful installations.

(6) Expressing appreciation for the excellent work performed by the USITA Toll Compensation and Settlements Committee and the executive officers of the USITA and urging continuation of the studies and work that have been started to further improve settlements on interchanged toll traffic with Independent companies; also calling for more equitable and simplified separations procedures.

The Washington association also passed a resolution opposing any disposition of public property, particularly with reference to the telephone property at Richland, Wash., now owned by the federal government in disregard of existing rights of an Independent telephone company ready and able to acquire and operate the telephone facilities.

D. O. Hood, president of Columbia Utilities Co. of Medford, Ore., opened the convention in the absence, due to ill health, of T. J. Wells, president of the Oregon Independent Telephone Association. Mr. Hood introduced the first speaker, Warren B. Clay, president of the United States Independent Telephone Association.

Mr. Clay, in outlining the work of the USITA and its various committees, said:

"Being connected with a small company I have come to realize the hopeless task which would confront us were it not for the splendid work being carried on by our associations.

"There was a time, years ago, when the most important part of our jobs as managers or owners of small companies, was the building and maintenance of good plants. Of course, that is equally important today, but other things have been added.

"We are now, in almost every state in the Union, under the regulation of a regulatory commission; many of the larger companies are also under the jurisdiction of the FCC.

"During the past several years, federal legislation has been enacted which vitally affects not only our companies but our subscribers as well. It is on these matters of legislation and regulation that our associations render such fine and necessary help to those of us in the small companies.

"Those of us working in the smaller companies realize that we not only have to be plant men as in the past, but also have to be conversant with traffic, commercial and public relations problems. We have to be lawyers, bankers, collection and advertising men.

"The national association, with its standing and special committees, with the more than 300 qualified men working on those committees and generously donating their time and talents for the welfare of all, provide a ready means of information and help to us, making our jobs easier and much more pleasant."

The balance of the morning meeting was presided over by John H. Dillard, Nehalem (Ore.) Telephone & Telegraph Co.

"Notes and Observations on Plastic Cable," was the subject of an address by Peter M. Ferguson, assistant manager and engineer of the Mankato (Minn.) Citizens Telephone Co. He reported on the experiences that his company has had with self-supported plastic cable since 1949, when its first installation was made. Mr. Ferguson said that there had never been a case of trouble on this cable and while there was a small amount of crazing, there has been no sign of deterioration of the cable.

Mr. Ferguson said that since this installation, his company had installed a considerable amount of plastic cable

—most of which has been on a permanent basis. Ninety-five per cent of the plastic cable, he said, is self-supported.

Mr. Ferguson used motion picture slides to show the various methods used by his company in installing and maintaining its extensive plastic cable plant.

Mr. Hood then reported on the work to assist small telephone companies in the Northwest. He is chairman of the Pacific Coast Area Small Company Regional Committee of the United States Independent Telephone Association. He is also a director of the USITA and of the Oregon Independent Telephone Association.

He told of the USITA committee's activities in finding purchasers for telephone properties and also, in assisting and negotiating consolidations of small companies with larger companies on the Pacific Coast.

Mr. Hood stressed the importance of maintaining a strong Independent telephone industry. He referred to the negotiations between the American Telephone & Telegraph Co. and the United States Independent Telephone Association to retard the purchase of Independent properties by Bell interests in the early years of the telephone business. Mr. Hood told of the activities of the current USITA Bell Acquisitions Committee in working with the Bell System toward preserving Independent ownership of existing telephone companies. He reported that both segments of the industry are cooperating toward this end. He continued:

"I feel safe in stating that it is not the policy of the USITA directors nor the members of the Bell Acquisitions Committee to attempt to completely block all future sales of Independent properties to Bell companies regardless of the circumstances.

"It is recognized that situations may continue to develop where such may be the only alternative, but we know that such situations will be far more the exception than the rule.

"What we are striving for is preservation of the existing ratio of Independent to Bell ownership insofar as may be possible. . . .

"The preservation of our industry as a free enterprise business is certainly strengthened by the continued existence of a strong Independent segment comprising many companies. . . . This has never been more important than now, and the same applies to our Independent manufacturers and suppliers as well.

"If such a strengthening factor did not exist, the industry would soon become a 'pushover' for ultimate government ownership, either federal or local, or possibly both."

MRS. W. R. JARMON (left) of Spokane, Wash.; DON CHILDERS, president of the Washington telephone association, and MRS. CHILDERS, photographed at the Oregon-Washington banquet.

In this group "snapped" at the Oregon-Washington convention are, left to right: A. J. ZIMMERMAN, executive director of the Washington Independent Telephone Association; MRS. ZIMMERMAN; T. J. WELLS, president of the Oregon Independent Telephone Association; W. R. JARMON president of the General Telephone Co. of the Northwest, and vice president of the Washington Association.

The afternoon meeting on June 18, presided over by Mr. Dillard, commenced with an address by Ray Smith, editor of *Telephone Engineer*, on the subject "Good Plant—Good Service—Good Rates."

Mr. Smith said that at least one regulator—George R. Perrine, chairman of the Illinois Commerce Commission—is of the opinion that a great deal of the difficulty in the average rate case comes from the ignorance or the misunderstanding of the public as to what it is all about. And, he said, Mr. Perrine attributes a considerable portion of this misunderstanding and ignorance to two specific causes—one of them politics and the other a "poor press."

Mr. Smith went on to say:

"The conclusion seems to me to be inevitable that the only way by which the telephone company can prevent, offset or alleviate the damage to it from the sources described, is to carry its case directly to the public itself.

"This has been done many times, of course, with varying degrees of

Shown at the speakers' table at the Oregon-Washington convention are, left to right: D. O. HOOD, chairman of the USITA Pacific Coast Area Small Company Regional Committee; WARREN B. CLAY, president of the United States Independent Telephone Association; JOHN H. DILLARD, newly elected president of Oregon Independent Telephone Association. Photos courtesy of Oregon and Washington Independent Telephone Associations.

success. We think that in many cases, however, the explanation given by the telephone company has been too long, too technical and too 'dry' to create a lasting impression in the public mind.

"The telephone industry needs, I believe, a short, concise, simple and easily understandable story of its position and situation in a rate case."

Another industry problem discussed by Mr. Smith, was one he termed "the current cost of depreciation." The cause of the problem, he said, is inflation. He observed:

"Non-regulated industry, faced with the same problem in this inflationary period, is on the whole dealing with it realistically. Many such companies are making provision for depreciation of their equipment and machinery on the basis of replacement costs, rather than original cost. Management of such companies feel that, otherwise, they would be overstating their profits.

"Hope for a similar policy in the telephone industry lies only in the liberalizing of depreciation policies by regulatory commissions."

After the separate business meetings of the Oregon and Washington associations, there was a Plant-Traffic Forum, conducted by L. Gray Beck, chief engineer of the West Coast Telephone Co. of Everett, Wash., and an Accounting-Commercial Forum, conducted by Lowell Brown, manager of the Interurban Telephone Co. of Silverton, Ore.

At the Plant-Traffic Forum, Mr. Beck presented motion pictures depicting recent developments in line trucks and cable-reel trailers; also new ideas in central office building construction, microwave layouts, etc. Walter Boro, general traffic superintendent of General Telephone Co. of the Northwest, Spokane, Wash., discussed traffic methods. P. M. Ferguson of the Mankato, Minn., company, answered a number of questions deriving from his speech earlier in the day, in regard to plastic cable.

At the Accounting-Commercial Forum, Mr. Brown presided over a general discussion of accounting methods and commercial practices. He was assisted by J. L. Kennedy, Robert Unruh and F. Mehl of the Oregon Public Utilities Commission's staff.

The morning session on June 19, with Don Childers, president of the Washington Independent Telephone Association, presiding, opened with a film, "The Directory Story," presented by the General Telephone Directory Co.

This was followed by an address on "Objectives of the REA Telephone Program," by Ancher Nelsen, administrator of the Rural Electrification Administration. Mr. Nelsen said:

L. M. CURRY, president-elect of the Washington telephone association.

"REA is in the rural telephone picture by direction of Congress in passing the Rural Telephone Amendment in 1949. Congress was quite specific about the role it assigned to REA. REA's function is to make loans. It is not empowered to go into the telephone business nor to put existing telephone companies out of business. No one on the REA staff has any desire to cause such harm to the telephone industry.

"A year ago, the Appropriations Committee of the House of Representatives inserted language in its report recommending that we encourage private telephone companies to do the rural telephone job where possible. We feel that recommendation has merit and we have attempted to follow it.

"We are prepared to call attention to the job that needs doing and urge that existing companies provide the service. If the companies can provide their own financing from private sources, well and good. If they cannot find satisfactory long-term financing, then we stand ready to consider applications for loans.

"Where, for whatever reason, an existing company declines to serve the demand or where there is no existing company at all adjacent to an unserved area, REA is prepared to extend a helping hand to any local group of rural people who want to set up their own mutual or cooperative service for themselves."

Mr. Nelsen concluded:

"Our only objective is to help telephone systems provide adequate modern service to more farmers, and we propose to cooperate fully with industry to that end.

"We have tried to maintain close relationships with all phases of the industry—Bell, USITA, the state associations and the cooperatives.

"Our purpose is to cultivate understanding and cooperation. Perhaps our efforts in the year we have been in office have not been totally successful, but we do feel that great strides have been made."

The final address of the convention was made by Joseph F. Leopold, Dallas, Tex., of the National Tax Equality Association. Mr. Leopold dealt with the inequities of our taxation system, whereunder there are numerous cooperative concerns and government departments operating unrestricted and tax-free, in competition with ordinary business concerns that are handicapped by heavy taxes. He pointed out the dangerous socialistic trends of which such unfair and inequitable taxation is a part.

The Oregon association elected John H. Dillard, manager of Nehalem Telephone & Telegraph Co., as its president. Lambert Miller, manager of Sunnyside Telephone Co., was elected vice president. Leslie A. Gritten of the West Coast Telephone Co., Everett, Wash., was re-elected secretary-treasurer.

Directors elected by the Oregon association were: M. F. Berglund of De Lake; Lowell Brown of Silverton; John Cavanaugh of La Grande; Lyle Cross of Beaverton; Rodney Cummings of Philomath; Floyd Day of Estacada; Earl Dean of Hood River; Don F. Gibbs of Cave Junction; D. O. Hood of Medford; E. R. Hood of Portland; Donald Kyle of Spray; L. E. Scott of Lebanon; T. J. Wells of Redmond, and H. O. Wiswell of Haines.

The Washington association elected L. M. Curry, manager of Yelm Telephone Co., as its president. W. R. Jarmon, president of General Telephone Co. of the Northwest, was elected vice president. J. W. Baker of Coeur d'Alene, Idaho, was re-elected secretary-treasurer. A. J. Zimmerman of Seattle was re-elected executive director.

Trustees elected were W. F. Barnett of Vashon; Lee Bolles of McCleary; Don Childers of Sunnyside; L. M. Curry of Yelm; Ray Dalton of Everett; Hugo Finholm of Gig Harbor; B. L. Gaines of North Bend, and A. R. Gately of Orting.

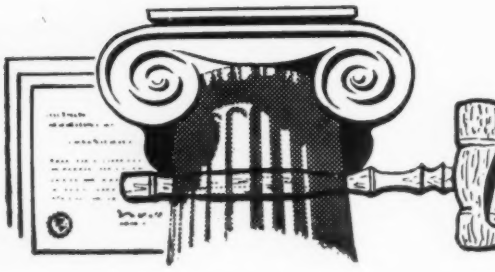
Also Maurice Hull of Forks; W. R. Jarmon of Spokane; W. C. Mumaw of Aberdeen; W. G. Pottratz of Cowiche; J. R. Reynolds of Naches; R. E. Rudolph of Ellensburg, and G. J. Stover of Mount Vernon.

V V

"People seldom improve when they have no other model but themselves to copy after."—GOLDSMITH.

V V

"The truly strong and sound mind is the mind that can embrace equally great things and small. I would have a man great in great things, and elegant in little things."—JOHNSON.



Courts and Commissions

Approve Mutual's Purchase of North Dakota Properties

The North Dakota Public Service Commission recently authorized the Polar Rural Telephone Mutual Aid Corp., Petersburg, to purchase from the North Dakota Telephone Co., Minneapolis, Minn., properties at Bathgate, Neche, Cavalier, Bowesmont, Drayton, St. Thomas, Crystal, Hoople, Park River and Michigan, N. D. (TELEPHONY, Apr. 10, p. 36).

The Polar company was also authorized to borrow $468,280 from REA, to mortgage its holdings and to secure the REA loans.

V V

Va. Company Asks Approval Of Stock Issue

Central Telephone Co., Charlottesville, Va., whose North Carolina headquarters are at Mount Airy, asked the North Carolina Utilities Commission on July 10 for permission to issue 1.5 million dollars worth of convertible subordinated debentures.

The notes would pay up to 4.75 per cent interest and would mature May 1, 1969. The company said it would convert them into common stock between May 1, 1955, and Apr. 30, 1960.

The stock issued in exchange for the notes would have an exchange value of not less than $16.50 per share for the first five years, $17.50 for the next five years, and $19 for the final five years.

V V

Michigan Bell Case Hearings Postponed

The Michigan Public Service Commission on July 7 postponed hearings on the Michigan Bell Telephone Co. petition for a rehearing on the commission's earlier denial of a 22 million dollar annual rate increase. No date had been announced at this writing for renewal of the hearings.

The postponement was made on the motion of Assistant State Attorney General Robert Derengowski, who said some of the notices sent out by the commission for the hearings were in error.

Mr. Derengowski also urged the commission to broaden the hearings to cover a determination of the reasonableness of the company's present rates. He was joined in this plea by James H. Lee, assistant Detroit corporation counsel, and Leonard Symon, assistant Wayne County prosecutor. This motion was opposed by Jack I. Schuler, general attorney for Michigan Bell, who contended it would be legally improper under the petition filed.

Mr. Derengowski's motion, as well as several by Lee, was taken under advisement by the commission.

Mr. Lee asked that the company be required to disclose the financial operations of its "yellow pages" advertising section in the telephone directories, whether they were copyrighted, and the facts on its two-way radio system available for private fleet operations.

V V

Suspend Southwestern States' Arkansas Rate Raise

The Arkansas Public Service Commission recently issued an order suspending for an additional period of six months new schedules of rate increases in Arkansas, asked by Southwestern States Telephone Co., Brownwood, Tex. The order was effective on June 1 (TELEPHONY, Mar. 6, p. 24).

Under previous order of the commission, the company's rate increase was suspended for a period of 90 days, but the commission stated that it "now finds that it is in the public interest to suspend the schedules of rates to allow the staff of the commission additional time to investigate the reasonableness of the charges."

Under Arkansas law, even though the commission suspends the rate increase, the company can continue to charge it under bond, and Southwestern States filed bond under which it has been charging the additional rates since it applied to the commission for the increase.

In order to keep charging subscribers at the new rates, the company will have to continue bond during the next six months while the order of suspension is in effect.

If the commission should refuse the rate increase being asked by the company, subscribers would be refunded the extra amount they will have paid during the months the increase will have been charged.

V V

Virginia T&T Co. Granted $240,000 Annual Rate Raise

The Virginia State Corporation Commission on July 9 granted the Virginia Telephone & Telegraph Co., Charlottesville, permission to increase rates, effective Aug. 1, to produce approximately $240,000 a year additional gross revenue (TELEPHONY, May 1, p. 31).

The company's application was approved as filed, except in the case of its exchange at Altavista, where the commission said higher rates could not be placed in effect until a dial system is installed.

New rates for the company's exchanges at Brookneal, Burkeville, Dillwyn, Palmyra and Stanardsville will not become effective until the current program of conversion to dial systems is completed. In Luray, an interim rate scale was approved, and a still higher scale will be placed in effect when a dial system is installed there.

Among the other localities in which rates will be increased are: Blackstone, Burkeville, Farmville, Hampden-Sydney, South Boston, La Crosse and Brodnax.

V V

Kansas Commission Denies Certificate to Co-op

The Kansas Corporation Commission on July 7 turned down an application of the Cimarron Valley Telephone Association of Ashland, for a certificate to operate in Clark and Meade counties.

The association, an REA co-op, proposed to purchase the Ashland and Englewood exchanges from the Western Light & Telephone Co., convert them to dial operation and rebuild the outside plants.

In rejecting the cooperative's application, the commission said the plan would have changed ownership of the exchanges "from a large, well established company, with a strong financial position, to a small corporation with no telephone operating experi-

ence, dependent entirely on the federal government for capital improvements."

The cooperative proposed to buy the two exchanges from Western Light & Telephone for approximately $111,000. It also sought authority to borrow $401,000 from REA to finance the project.

The commission said testimony showed the present exchanges could be put in condition to render reasonably efficient service to existing customers at a cost of only $25,000.

Under the cooperative's proposal it would have had a debt nearly $50,000 in excess of the value of the rebuilt property, the commission said.

It said a substantial increase in rates would have been required to finance operation of the cooperative and only 49 more customers would have received service.

In another action, the commission granted the Miltonvale Telephone & Telegraph Co. a $4,182 increase in rates, effective in 30 days. The company serves 476 customers in and around Miltonvale.

V V

United of Indiana Asks Rate Increase

United Telephone Company of Warsaw, Ind., with 74 exchanges and 60,000 customers in northern and north central Indiana, on July 2 petitioned the Indiana Public Service Commission for an increase in rates of an unspecified amount.

The company asked for rates which are "fair, just, adequate and not confiscatory." It said $5,435,945 had been spent in improvements since the last rate increase was granted by the commission in 1950 and that $1,666,078 will be expended for this purpose in 1954.

V V

Bill Puts New Mexico Rate Increase Into Effect

By posting $400,000 bond, the Mountain States Telephone Co. put new rates into effect July 7 in New Mexico pending a decision by the New Mexico Corporation Commission on its latest application for a rate increase.

E. C. Phillips, the company's general manager in the state, said the new rates will give customers roughly a 20 per cent reduction from the rates they paid during the last year.

The company raised its New Mexico rates $1,741,000 a year gross in June, 1953, after the commission refused to approve the action. The state supreme court recently upheld the commission but expressed doubt the company rates prior to June, 1953, were producing sufficient earnings.

Mr. Phillips said the higher rates now being put into effect amount to about $1,390,000 a year, approximately 80 per cent of the previous raise the commission and the court denied.

The company has applied to the commission for approval of the interim rate increase now being put into effect and also has filed an "open end" rate request in which the commission is asked to determine the company's value and proper rate of return, upon which the company can file corresponding rates.

V V

Ohio Commission Proposes Minimum Service Standards

The Ohio Public Utilities Commission on July 12 issued a proposed administrative order setting out the state's first list of minimum telephone service standards.

The order, which Commissioner Ralph A. Winter said was "designated to improve the over-all telephone service picture," calls for a hearing on Aug. 2, on a dozen rules embracing practically all aspects of residential service.

[*EDITOR'S NOTE: With the view of maintaining and, where necessary, improving the quality of telephone service in Ohio, Commissioner Ralph A. Winter of the Ohio Public Utilities Commission, recommended that minimum standards of service be established for the industry in Ohio.*

Apparently recognizing the benefits that would accrue to the public in Ohio and to the industry itself, the directors of the Ohio Independent Telephone Association appointed representatives, who with a representative of the Bell companies, acted as an industry committee that worked closely with the commission in drafting the service standards.

A public hearing in connection with its order will be held by the Ohio Public Utilities Commission in Columbus on Aug. 2 at which members of the industry can offer their comments.]

Mr. Winter said every telephone company in the state would have at least one exchange affected by some part of the order if the commission decides to file it with the secretary of state after the hearing.

The standards, which have varying effective dates, would have the effect of law 10 days after such a filing. However, the full effect of the order would not be felt for two or more years because some of the deadlines for living up to the rules are for July 1, 1955, and others for July 1, 1956.

Mr. Winter said adoption of the order, which he described as "merely a starting point," could be one of the most important and far-reaching things that ever has happened to bring better telephone service to Ohio."

It deals with such fundamental problems as adequate and sufficient facilities for both local and long distance service, delayed calls, maintenance and repair, improved transmission, trouble reports, service interruptions and service applications.

Commissioner Winter said the recommended order in its present form was not expected to cure all telephone service ills, but that it can be strengthened and amended to whenever the necessity arises. He said it would provide the first yardstick whereby the commission's staff can classify and measure the quality of service given, and thus would simplify the processing of service complaints.

Today's proposed order contains 15 main headings and many subclassifications.

It would ban the installation of any more grounded lines, and it requires unrestricted local and long distance service from every exchange for 24 hours every day of the year. Grounded lines must be converted by mid-1956, according to the terms of the order. These provisions mean that all new lines must be metallic, microwave or carrier, with a consequent improvement in transmission. They also mean no exchanges will be shut down at night or on holidays.

The suggested order says that each company "shall provide . . . sufficient central office equipment and personnel to assure that subscriber and customer calls will be handled without unreasonable delay under normal operating conditions." It says operators in manual exchanges must answer 85 per cent of all calls during the business day within ten seconds. In dial offices, the 10-second time limit would apply to 90 per cent of the calls.

The proposed order states that "Ninety-five per cent of all interruptions of telephone service shall be restored within a maximum of two normal working days, excepting therefrom interruptions caused by emergency situations. . . ."

It also says all companies must keep written records of applications for new or upgraded service and that the applicant must be notified within 30 days, and periodically thereafter, if his request cannot be filled immediately.

Concerning speed of call completion, the recommendation is that, "Sufficient interoffice channels shall be provided to handle the normal offered traffic without unreasonable delay." This was spelled out to demand enough trunklines so that an exchange should not

encounter more than 10 busy signals per 100 calls "for the average busy hour." Ninety per cent of all long distance calls should be completed within 10 minutes during the same hour.

Further, the proposal requires all companies to file maps by exchanges rather than by total service areas. It also says the companies must specifically set forth the rules for "allowances made to subscribers for service interruptions and conditions under which the telephone company may discontinue, suspend or refuse service, or require advance payments or deposits."

These rules, in many cases, would insure customers of receiving more definite information and so cut down controversy on certain complaints.

Switcher line rules are that there must be no more than 10 main stations per line, construction must meet the provisions of the National Electrical Safety Code, batteries must be used no more than 18 months and there must be enough maintenance to "permit effective service . . . to and through the point of connection with . . ." the company facilities.

A provision that each company "shall maintain a written record of each case of trouble or service interruption" is designed not only to help correct the individual service disturbance, but also to pinpoint the causes of trouble and help remove them.

Commissioner Winter said the application of all these rules would "cover and help eliminate a major portion of all the complaints that come before the commission."

V V

Seven Ohio Companies Denied 10-Cent Paystation Increase

The Ohio Public Utilities Commission on July 8 refused to allow seven telephone companies to raise paystation rates, despite the fact there were no protests offered at the hearings (TELEPHONY, Jan. 30, p. 34).

The commission ruled the Delta Home Telephone Co.; the General Telephone Co., of Ohio, Marion; the Chillicothe Telephone Co.; the Warren Telephone Co.; the Elyria Telephone Co.; the Conneaut Telephone Co., and the Mansfield Telephone Co. could not increase paystation rates from five to 10 cents, in this instance.

The commission's decision was contrary to the recommendation of Attorney-Examiner C. Howard Johnson, Jr., who heard the case.

V V

Cal. Company Seeks Increase

An application was filed with the California Public Utilities Commission on July 8 by the Delta Telephone & Telegraph Co., Courtland, for permission to increase rates.

V V

Carolina Company Seeks O.K. Of New Stock Issue

The Carolina Telephone & Telegraph Co., Tarboro, on July 13 asked the North Carolina Utilities Commission for authority to issue 66,640 new shares of stock, and stated that if the commission requires it to sell the stock for more than par the market for the company's stock may be weakened.

The hearing was on a new petition by the company which replaced an earlier request asking permission to issue 33,320 shares of new stock. The original proposal was approved by the commission, which, however, stipulated that the stock should be sold for $115 per share, instead of the $100 par value proposed by the company (TELEPHONY, May 29, p. 32).

The company appealed the ruling, and the North Carolina Supreme Court sent the case back to the commission with instructions that it rewrite the contested order and show by "definite findings of fact" why it considered the $115 per share price to be proper.

The commission had held in its order that since Carolina T&T stock regularly is quoted above par by brokers, and since the company sought money to carry out an expansion program, it should sell the stock for a price nearer the actual value of the stock.

After the supreme court sent the original case back, the company filed the new petition seeking to issue 66,640 shares, instead of 33,320, and at the par value of $100 a share. The stock, as in the original petition, would be offered to present stockholders, and at the rate of two shares for every five shares now held.

At the hearing held on July 13 on the new proposal, L. W. Hill, company president, told the commission that it always has been the company's policy to offer new common capital stock at par to its existing stockholders under their pre-emptive rights in the company's charter.

The hearing was recessed to be resumed at a later date, not set, when the state's attorney general's office, representing the public, will submit testimony and evidence to support the contention that the price should be set higher than par.

Mr. Hill said on July 16 that the company must curtail its 8-million-dollar 1954 construction program pending the commission's final decision as to the issuance and sale of the company's additional common capital stock.

Mr. Hill said that construction already in progress could not be stopped immediately without some monetary loss and that about 2 million dollars which would be secured from additional short-term bank loans, would be required to complete the work now being performed and work scheduled for which materials have been ordered.

"It is mandatory, if we are to continue to fulfill our obligation to the public, that we maintain a sound financial structure," he said. "The continuation at the present time of our program and additional debt obligations which would be brought about by such continuation would not be in the public interest.

"To maintain a sound financial structure the next permanent financing must consist of an issue of common stock after which the company could continue its policy of temporary financing through the medium of short-term bank loans."

V V

Upholds Six Minute Limit On Telephone Calls

The Indiana Public Service Commission on July 10 upheld the right of the Schnellville Telephone Co. to cut off long talking subscribers after six minutes of conversation on the telephone.

The commission turned down a complaint against the company's practice of sounding a buzzer after six minutes and then cutting off the call.

V V

Wiretapping Evidence Held Valid in Pennsylvania

The Pennsylvania Superior Court on July 13 upheld the admissibility in state courts of evidence obtained by wiretapping.

It was the first time the issue was taken before an Appelate Court in Pennsylvania. Wiretapping is still an undecided question on the national legal level.

Acting on an appeal by a Lancaster County man convicted on bookmaking charges in December, 1952, Judge Robert E. Woodside upheld the conviction, ruling that "Pennsylvania has never made it a crime for a public officer to tap a telephone wire to obtain evidence."

The appelant, Isaac Chaitt, was convicted in the Court of Sessions in Lancaster, fined and given a prison sentence.

In his appeal, he conceded that it had been the practice in state courts to admit wiretapping evidence but he asked the superior court to "promulgate a rule of evidence, applicable to the courts of the state, that any evidence

why men who know carrier use

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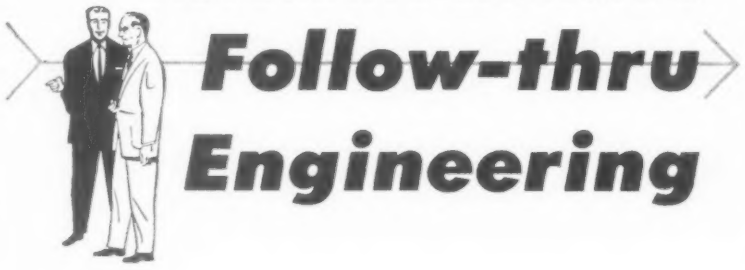

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AUTOMATIC ELECTRIC—LEADERS IN CARRIER COMMUNICATION—**LENKURT**

obtained by tapping a telephone wire should not be admissible."

Judge Woodside cited a long history of legal decisions to uphold the majority opinion that wiretapping evidence does not violate the Fourth, Fifth or Fourteenth Amendments nor Section 605 of the Federal Communications Act of 1934.

V V

Applies for Authority to Buy Pennsylvania Company Stock

It was recently reported that an application to purchase outstanding stock in the Pennsylvania Community Telephone Co., Bangor, was filed with the Pennsylvania Utility Commission by Andrew J. Sordoni, state secretary of commerce and owner of the Commonwealth Telephone Co. in Dallas, Pa.

V V

Hawaiian Company Converts Island of Molokai to Dial

July 1 marked the conversion of the island of Molokai's 576 telephones from magneto to dial, D. S. Guild, vice president in charge of operations of Hawaiian Telephone Co. recently announced. On the same day, 90 new telephones went into service.

The trouble free cut-over was accomplished at 5:15 a.m. At the same time, Elsie Will, long-time telephone employe on Molokai, ceremonially cut the old cables connecting the island's old manual system at Kaunakakai.

Cut-overs were also made at new exchanges at Ualapue, Maunaloa and Kalapaupa (the Hansen's Disease settlement on Molokai).

Molokai is the second island in the Hawaiian company's six-island system to be served entirely by dial equipment. The island of Lanai, used to grow pineapple for Hawaiian Pineapple Co., was first when its 303 telephones were converted to dial in 1949.

At present, the Hawaiian Telephone Co. system is 95 per cent dial, and in the next few years, the company plans to furnish 100 per cent dial service on all islands.

When purchased by the company in 1931, Molokai's telephone system consisted of 50 miles of wire, two switchboards, 14 telephones and 48 payboxes. Most of the payboxes were in storage, and were telephones with coin box attachments for use in private homes.

Since that time, Hawaiian Telephone Co. has invested nearly $480,000 in plant on that island, and in 1955 will spend around $83,000 for new radio equipment to improve and increase radio-telephone calling to and from Molokai.

Chase Bank Names McMahon Second Vice President

Thomas W. McMahon Jr. has been made a second vice president in the Public Utilities Department of the Chase National Bank of New York.

Born in Newark, N. J., Mr. McMahon received his early education in that city before attending Rutgers University, graduating in 1942 with an A.B.

T. W. McMAHON JR.

degree. He served with the U. S. Army (Pacific Theatre) from 1943 to 1945 and returned to Rutgers after the war. In 1946 he received a B.S. degree from Rutgers and the following year earned an M.S. at Columbia University's Graduate School of Business.

Mr. McMahon joined the Chase bank in 1947 and the following year was assigned to the Public Utilities Department. He was appointed to the official staff in 1951 as an assistant cashier.

V V

Booklet Tells Company Story To New Employes

New employes of General Telephone Co. of California, Santa Monica, Cal., now receive a 28-page illustrated booklet entitled "In General." This brochure (5 inches x 7 inches) serves as a welcome to the new employes and covers such things as the history of the company and the role of the Independent industry; also, it describes company departmental operations and employe benefits.

Page No. 1 of the booklet contains a word from the company's president, Edwin M. Blakeslee. A portion of his welcoming address states: "When we work for the telephone company we accept a two-fold obligation. We accept the obligation to perform our part in furnishing an essential service to the public, and we accept our responsibility to our company's stockholders, without whose investment we should have no jobs and no plant to operate.

"These obligations will be fulfilled coincidently if each of us does his best to perform his job in the most economical and efficient way; for it is not the occasional spectacular performance that counts but the sum of the constant and sincere efforts of all of our people to discharge their trusts faithfully."

One of the features of the booklet is a loose-leaf insert showing the company's organization chart from president to the division manager level. Portrait photographs of the officers and department heads are included.

The message closes with a statement about the employes' obligations when working for a public utility and why its operations differ from other industries.

V V

General Converts 102nd Exchange to Automatic

Hugh K. Funderburg, a director of the General Telephone Co. of Illinois, on June 15 threw the switch that activated the new automatic equipment of that company's exchange at Belvidere. This made the 102nd dial operated exchange for the company.

In 1896 Belvidere was serving around 400 telephones and at the time of dial conversion had over 4,700 stations. With the change to dial service came a gain of 88 stations and the upgrading of 122 stations.

One of the features of the new Belvidere central office building is a 24-hour-a-day paystation and bill payment depository, both built into the front of the building. Directly inside the entrance are a number of other paystations.

The equipment was manufactured by Automatic Electric Co. Belvidere is the third General Telephone Co. of Illinois exchange to be equipped for full nationwide toll dialing.

V V

West Virginia Rate Raise O.K.'d

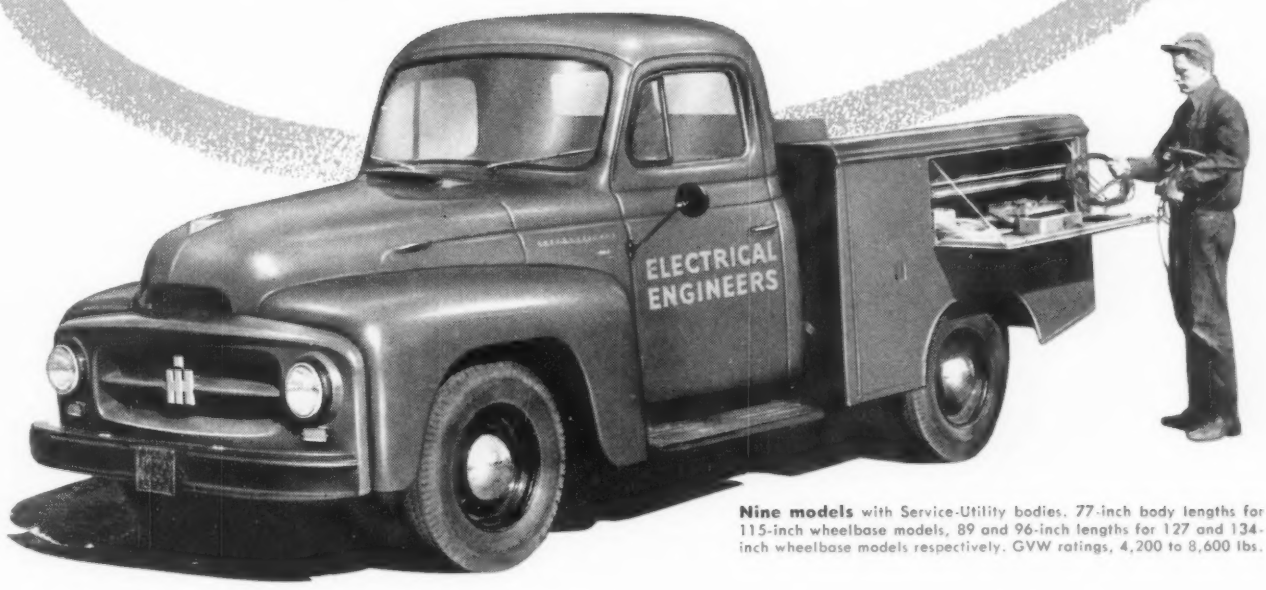
The West Virginia Public Service Commission recently granted a rate increase sought by the Duncan Telephone Co., Davis, for some 335 subscribers at Inwood in Berkeley County.

V V

Minnesota Independent Sold

The Minnesota Railroad & Warehouse Commission on July 6 authorized sale of the Hills Telephone Co. to Sidney R. Hammer Jr.

Trip saver...
Time saver...
Money saver



Nine models with Service-Utility bodies. 77-inch body lengths for 115-inch wheelbase models, 89 and 96-inch lengths for 127 and 134-inch wheelbase models respectively. GVW ratings, 4,200 to 8,600 lbs.

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GLOSSARY OF TELEPHONE WORDS

Concluded from page 30

the receiving machine is stopped after each letter and started by the next one.

Static. (1) Electric charge which stands still, as a bound charge on a condenser plate; (2) interference to radio reception due to electrical discharges; "Atmospherics."

Station (Telephone). Telephone set and associated wiring.

Station, Teletypewriter. Teletypewriter and associated wiring and apparatus installed in a customer's premises.

Stearine. Fatty solid acid used by cable splicers as a flux for soldering lead.

Step-by-Step Dial System. An automatic dial system in which each call is extended through the central office by a succession of switches each of which move step by step to the desired terminal under direct control of the subscriber's dial.

Step, Pole. Foot support fastened to the side of a pole.

"Sticks." Test cords and shoes used for tests on protector springs and distributing frames.

Straight-Forward. Automatic one-way signaling.

Strand, Guy. Cable made of strands of steel fastened to an anchor of some sort at one end and to a pole at the other for additional strength.

Strand, Suspension (Messenger). Steel cable made of several wires twisted together, supported by poles or other structures and in turn supporting a cable lashed to it or supported from it with rings.

Stringing. Work of placing wire in position for use.

Strip, Designation. Usually a strip of paper with a transparent covering used to mark the assignment of jacks or other apparatus below it.

Strip, Test. Strip of cloth or fibre with numbered holes for inserting cable pairs or quads to identify them.

Strip, Stile. Vertical strip between jack fields.

Strip, Terminal. See **"Block."**

Stub, Cable. See **"Cable."**

Stub, Guy. Short pole used to terminate a guy to a line pole as at a corner. The stub is in turn anchored to the ground with an anchor guy.

Stub, Terminal. Short piece of cable comes with a cable terminal for splicing into the main cable.

Sub-Office. Dial central office which has only line equipment, repeaters and connectors, with the first selectors located in the "master office."

Subscriber. Customer of the telephone company served under an agreement of contract.

Subset. Subscriber's telephone set.

Supply, Power. Source of electrical energy required for operation.

Suppressed Carrier. Term used to designate that type of system which results in the suppression of the carrier frequency from the transmission medium. The intelligence of a carrier wave after modulation is contained in either sideband, and normally only one sideband is transmitted; the other sideband and the carrier frequency are suppressed.

Suppressor, Noise. Device for absorbing or shunting off noise energy.

Suppressor, Radio Frequency. Device to absorb radiated energy which might cause interference to radio reception.

Susceptance. Reciprocal of impedance.

Susceptiveness. Tendency of a telephone system to pick up noise and low frequency induction from a power system. It is determined by (1) telephone circuit balance; (2) transpositions; (3) wire spacing, and (4) isolation from ground. See also **"Influence"** and **"Coupling."**

Swing. (1) An occasional trouble due to or similar to two wires swinging together; (2) arc traversed by the needle of a meter.

Switch, Out-Trunk. Outgoing secondary trunk switches, rotary or plunger, are interposed between the local selector banks and the impulse repeaters. Through their use, material economies may be effected in the number of interoffice trunks, associated impulse repeaters, and incoming selectors required to carry the traffic load.

Switchboard. Cabinets in which lines and subscriber's lines appear and are interconnected by hand.

Switchboard, "A." Switchboard where subscriber's lines appear for answering.

Switchboard, "B." Switchboard for completing calls from subscriber's which come in on trunks from an "A" board.

Switchboard, DSA. Dial service auxiliary switchboard. A manual switchboard associated with a dial central office to handle auxiliary services such as intercepting, information, manual foreign exchange lines, etc. Sometimes also used as the "Telephone Company" PBX.

Switching, Machine. System for making telephone connections automatically without the assistance of manual operation.

Switching-Selector Repeater. Switching-selector repeater combines the functions of both a selector and a repeater with a means for switching from one to the other. It serves as a repeater on calls to other offices, and as a selector on local calls.

Switch Room. That part of a central office in which are located selectors and associated apparatus for dial operation.

Symbols. Coded figures used to represent circuit and plant elements on drawings and records.

Synchronization. Rigorously the precise matching of two waves. In carrier, that degree of matching, in frequency, between the carrier used for modulation and the carrier used for demodulation which is sufficiently accurate to permit efficient functioning of the system.

System, Cross-Bar. Plan and method for operating telephone service by using cross-bar switches.

System, Public Address. Assembly of microphones, amplifiers and loud speakers for addressing audiences or public gatherings.

System, Transposition. Orderly plan for changing the position of wires in an open wire line to reduce noise and cross-talk.

SX. Abbreviation for **"Simplex."**

Ohio Association Has Booklet On Its Many Services

The Ohio Independent Telephone Association has produced an illustrated four-page booklet describing its many services. Copies may be obtained by writing Daniel W. DeHayes, secretary-treasurer of the association, 3420 LeVeque Lincoln Tower, Columbus, O.

The booklet will find many uses throughout the industry, Mr. DeHayes reports. "We're going to send it to the 116 Ohio companies who are now active members. It will help them understand and utilize the many types of trade association services at their command. It will also go to our associate members and to a select group of active and associate membership prospects."

Since publication coincided with a change in the association's telephone number, the new number is featured prominently on the front cover. Pages two and three discuss 10 major areas of the association's service, together with a statement on active membership dues. Page four is devoted to the advantages of associate membership.

The new booklet, new being sent to all state association secretaries, may well set the pattern for similar publications.

"As Independent telephony grows, its state associations grow stronger and stronger. Basic literature like this helps keep the industry united and strong," Mr. DeHayes said.

V V

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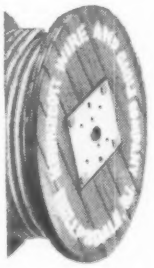

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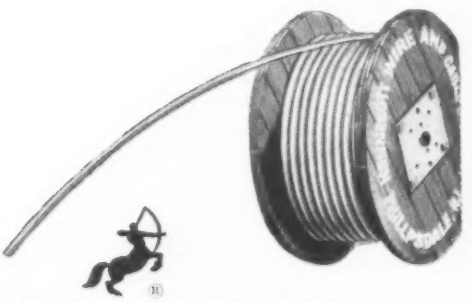

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IN THE NATION'S CAPITAL

Concluded from page 22

tion over a period of 10 or 15 years, means that telephone, gas, and electric companies must put on more steam, for the next session of Congress, with respect to some federal policy for reimbursement of relocation expenses.

As readers of this magazine are aware, efforts have been made for a number of years to have congress allow the utilities some measure of compensation for the amounts they must lay out as their part of highway construction and improvement. A determined effort was made during the present session of Congress when the Federal Highway Act was being amended to include such a provision in favor of reimbursing utilities for relocation expense. But it was put off for another year, at least, by the familiar device of referring the matter to an agency (Secretary of Commerce) for more study.

But the expense which utilities have suffered in the past in relocating facilities due to highway construction will only be a drop in the bucket compared with the vast sums they will have to put out if the government ever gets congressional approval of a 50 billion dollar program. There will be broad, straight highways all over the nation requiring the relocation of miles and miles of power lines, telephone lines, and pipelines to an extent never before experienced.

Now is the time, therefore, to make every effort to the end that the Secretary of Commerce will come out with a strong recommendation to the next Congress in favor of reimbursement to utilities for such highway construction expenses. After all, these are expenses which otherwise will have to be borne by utility customers, probably resulting in higher rates in many areas. There is, in the present situation, a great danger that the federal government would take the easy way out, by referring this problem to the states. It sounds very plausible to take the attitude that each state ought to work out its own solution to the problem of relocation expense. But there are good sound reasons for a uniform, central policy, which your correspondent hopes to present in this department in the near future.

V V

Missouri TV Station Linked To Bell System Network

Station KWK-TV, St. Louis, Mo., was connected to the Bell Telephone System's nationwide network of television facilities over the July 10 weekend according to an announcement by the Long Lines Department of the American Telephone & Telegraph Co.

The announcement said network programs for the St. Louis station are fed from the coast-to-coast microwave route at Chicago over intercity facilities. The TV signals are picked up at a Long Lines' telephone building in St. Louis and carried from there to the KWK-TV studio over a local link provided by the Southwestern Bell Telephone Co.

With the addition of station KWK-TV network programs are received by 302 stations in 193 cities in the United States.

V V

Ohio Company Stockholders Vote to Sell

Stockholders of the Elida Mutual Telephone Co., Gomer, voted to sell the company to the Lima (O.) Telephone & Telegraph Co.

Company officials said details of the sale still have to be worked out by representatives of the two companies.

V V

Wisconsin Company Cuts Over to Dial

The Osceola (Wis.) Farmers Mutual Telephone Co. on June 28 completely converted its Osceola exchange to dial operation, according to President Eugene L. Beyl.

The cost of the conversion will run about $320,000 obtained by loan from the Rural Electrification Administration Since the change about 50 new stations have been added.

Executive officers of the company are Mr. Beyl, president and manager; Paul Demulling, vice president; Clelland Jacquot, director; and Helen L. Berglund, secretary-treasurer. Bernard Miller, wire chief; Ralph Boucher, head lineman; and Mrs. Kenneth Mallin, assistant secretary, all of Osceola.

V V

"Our minds are as different as our faces; we are all traveling to one destination—happiness; but few are going by the same road."—COLTON.

V V

"Our duty is to be useful, not according to our desires but according to our powers."—AMIEL.

V V

"High hearts are never long without hearing some new call, some distant clarion of God, even in their dreams: and soon they are observed to break up the camp of ease, and start on some fresh march of faithful service."—JAMES MARTINEAU.

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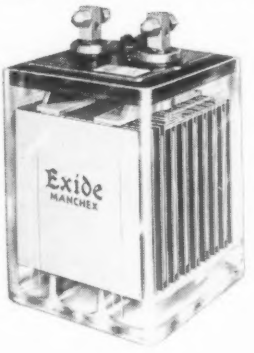

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CARRIER SYSTEMS

Continued from page 20

current that flows through the cathode, electron stream and plate circuit for the tube will also flow through the resistor RK. This route, incidentally, is the dc route for the power through the tube. It will be shown later that the ac or signal route is separate from this.

The cathode resistor may be of about 200 ohms resistance. A few milliamperes of current flows through it. As a result a small voltage drop, perhaps two or three volts appears across it. This voltage is used to provide grid bias, instead of the separate battery shown in the first experiment.

To see how this is done, it is best to draw the basic dc circuit for the tube in a slightly different layout.

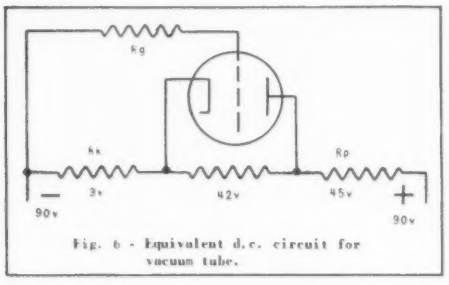

Fig. 6 - Equivalent d.c. circuit for vacuum tube.

At first look, this may appear quite different than the original drawing, but close inspection will show that it is exactly the same, except that the tube is shown sideways. The unmarked resistance shown between the cathode and the plate represents the resistance of the electron stream inside the tube. This is not ordinarily shown on circuit drawings, but it is there just the same.

Because of the fall of potential across a resistor, the original 90-volt supply is divided, so that 45 volts is dropped across the outside plate resistor, another 42 volts is lost across the electron stream in the tube, and the remaining three volts appears across the cathode resistor. The grid, it is seen, is connected to the negative side of the battery, at a point which is often grounded, or at least regarded as zero volts. Yet the grid needs three volts of negative voltage.

This it receives, because, as mentioned earlier, the reference or neutral point for a tube is its own cathode, not the outside ground or neutral. In *Fig. 6*, it will be seen that the cathode is three volts in the positive direction away from the point "G" where the grid is connected. It is more positive, because as you move to the right in the drawing you go towards the positive terminal of the battery supply. The cathode is three volts positive because of the three-volt drop of potential across the cathode resistor.

Now, if the cathode is three volts positive with respect to the grid, then by simple logic, the grid must be three volts negative with respect to the cathode. So this three volts of negative voltage is just what the grid needs and it gets it without using another battery.

Compare the other voltages in the drawing. Note that the plate is more negative than the power supply, but more positive than the cathode. This relation between voltages is very important in carrier and radio work. The measured voltage of a point may not be near so important as the relation of this voltage to some other voltage.

While still looking at *Fig. 6*, notice that no current flows in the grid resistor, RG. The grid in the vacuum tube, as long as it remains negative, draws no current, hence none flows in the external grid circuit. Therefore, though this resistor may be a half million ohms, there is no voltage drop, because no current flows, and the three-volt negative bias is not reduced.

Then why have the resistor? This is an example of how the use of a resistor differs in radio and telephone work. Returning to *Fig. 5*, observe that we are sending a signal of weak alternating current at a fraction of a volt, through the condenser CI, into the grid of the tube. This condenser prevents the three volts dc on the grid from leaking back into the phonograph pickup or other input voltage source, and perhaps being shunted down. The ac voltage carrying the voice or music can come through the condenser, however, and reach the grid.

If the grid resistor RG was not present, and the grid connected directly to the common negative or ground, the grid would still get its three volts, but the signal voltage, carrying the voice would promptly ground out at this point also, and never get into the tube. Again trace the dc path of the tube, from the negative battery, through cathode resistor through the tube, plate resistor and positive battery.

Input Path

Now trace the ac input signal path from the phonograph pickup, through condenser C1 through grid resistor RG back to the phono pick-up. A minute amount of current flows in this circuit. Therefore, a tiny voltage drop appears across the grid resistor RG. Remember that no dc drop occurs across this resistor, because the grid is open in the dc path. The dc voltage at the grid remains constant, but the ac voltage across the resistor, which is on series with the grid, fluctuates up and down as the signal varies.

This means that the signal voltage, say .1 of a volt adds and subtracts to the three volts of dc on the grid. This makes the grid become more and less negative as the signal varies. Instead of staying at three volts it constantly changes from 2.9 volts to 3.1 volts.

We have seen that changing the grid voltage even slightly, causes larger changes in the plate current. Let us now trace the output part of the signal circuit through the tube. The signal appears on the grid as described and varies the electron flow between plate and cathode. We may say that as far as the output is concernd the signal originates in the electron flow. It then travels to the plate and out through the plate resistor RP, back to the battery and up to the cathode and to the starting point in the electron flow. This current serves no useful purpose and is lost as far as being of any use is concerned.

This brings us to the function of the plate resistor. The voltage at the plate of the tube, which is connected to the top end of the resistor RP has a steady positive dc voltage on it when the grid is steady. When the signal varies the grid voltage the current in the plate resistor varies. Therefore, the voltage drop across it varies, and the plate of the tube becomes more or less positive as the signal fluctuates with the voice. It should be noted that this is fluctuating dc, not ac. However, fluctuating dc will act the same as ac as far as passing through a condenser is concerned.

If no plate resistor were in the circuit, the plate current would still continue to vary, but this variation would be absorbed by the battery or power supply. It would be the same as grounding out the signal, and the signal could not be used beyond that point.

Therefore, the resistor is added in the plate circuit, and it serves two purposes: It is high enough (perhaps 100,000 ohms) so that it grounds out very little of the signal, thereby acting to "limit" or "isolate" the signal current with respect to the battery. It also converts the fluctuating plate current into a fluctuating voltage because of the voltage drop across it. And it is voltage which will be required for the grid in the next stage of the amplifier, if it has several tubes. This type of amplifier is called a voltage amplifier, because only the increased

signal voltage is passed on to the next stage. Because the grid draws no current, the signal current is not passed on from one tube to the next.

In output stages, or so-called power tubes, a current operated device such as a loud speaker, is hooked into the plate circuit instead of the resistance. This then responds to the changes in plate current, and requires no voltage dropping resistor.

In *Fig. 5*, if the earphones were moved in and hooked up in place of RP, the phones would respond directly to the changes in plate current. As shown, however, they operate on the fluctuating voltage which comes through condenser C3. The current path is from the resistor, through the condenser, the phones, and back to the resistor. Note that this is not the same path as the plate dc current, which goes through the tube. Remember, also, that the resistor RP may be regarded as a battery of fluctuating voltage. In this we again see a resistance acting as a source of voltage.

To establish this concept of operation firmly in mind, it is recommended that each of the following circuits be traced over again as described earlier. In tracing them, regard them as complete electric currents on their own, and disregard the other connecting circuits:

(1) Signal input from phono to grid and back.
(2) DC path through tube from negative battery and back.
(3) Signal output path from plate back to cathode.
(4) Earphone circuit from plate resistor through phones.

Bear in mind that each of these circuits has separate functions and each must work on its own principles or they will not work together.

One other item should be explained at this point — the function of condenser C3. In the operation previously described, where the grid of the tube "valves" the current flow in step with the voice signal it carries, the current in RK will also vary, because it is in series with the plate circuit.

This would cause the voltage drop on this resistor to vary also. Because this voltage furnishes the negative bias for the grid, the grid voltage would then vary. But the grid is already varying with changes in the signal voltage, so the following situation would occur:

As the signal made the grid less negative, more current would flow in the resistor RK, which would produce a greater negative voltage to be applied to the grid. This would have the effect of cancelling out the signal on the grid. This effect is actually used in some circuits, and is known as degeneration.

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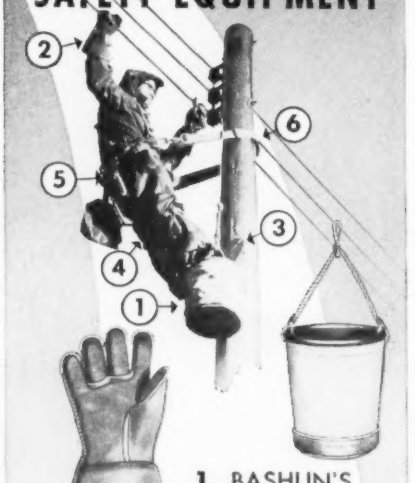

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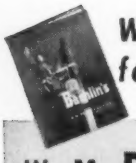

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In this circuit, however, condenser C3, which is of large value, by-passes the changes in current around the resistor, so the voltage drop does not follow the signal variations. In a manner of thinking, it may be regarded as having a smoothing action upon the changing current in the resistor.

From the foregoing the reader should remember that:

(1) The plate of a vacuum tube carries a positive voltage which draws negative electrons from the heated cathode, causing a current flow through the vacuum in the tube.

(2) This current flow can be regulated by small amounts of negative voltage on the grid, which acts as a valve in the flow of current through the tube.

(3) A small change in input grid voltage can cause a large plate current change, resulting in amplification or voltage gain.

(4) Resistors, in addition to being used to limit current flow, may also be used to obtain different voltages to be used in other parts of the circuit.

Further information in regard to resistance coupled amplifiers, tube characteristics, plate current curves, socket diagrams, and other functions of vacuum tubes may be obtained from the "RCA Tube Handbook," which can be obtained from most radio stores for about 50 cents. This handbook will also give voltage and resistance requirements for circuits like those shown above.

The next article in this series will relate to concepts of condenser and coil actions, tuned circuits and filters as applied to carrier systems.

V V

Safety Council Issues Three Booklets

The National Safety Council, 425 N. Michigan Ave., Chicago, Ill., has issued three booklets for those interested in safety.

The skeptical worker who wants to know what he stands to gain from working safely will get a ready answer from the council's new employe training booklet, "What's in It For Me?"

The 16-page booklet shows that everyone—the employer, the public and the worker—gains from a good safety program. Stressing the theme that no one is immune to accidents if he is not careful, the booklet drives home the fact that it is not where you work but how you work that makes for safety.

"What's in It For Me?" encourages the worker to help himself to happier, accident-free living by aiding the company in its fight against accidents. By reporting unsafe conditions and unsafe acts, the worker can help find a better and safer way of doing the job.

Illustrated in four colors, the booklet uses few words, but plenty of cartoons, to put across its message.

"Two-Wheel Hand Trucks," a recent addition to the council's safetygraph series, outlines the proper maintenance and use of two-wheel hand trucks.

The safetygraph tells how to inspect trucks, proper methods of loading and unloading, how to handle light bulky cartons as well as small heavy boxes, the importance of keeping the load balanced, the use of dock plates and other information.

The council's new visual aid provides a ready means of training small groups in the operation of two-wheel trucks. Consisting of 12 spiral-bound pages 18x24 inches inserted in a brown leatherette portfolio, the safetygraph can be set on any flat surface and opened to form an easel.

On the pages facing the audience are clear and accurate drawings showing the proper maintenance and use of two-wheel hand trucks. Notes for instructors are printed on the back pages in large easy-to-read type. Thus foremen with little speaking ability are provided with both notes and visual aids in one ready-to-use package.

The council's new book, "Safety Devices and Ideas," describes more than 90 safety devices which have been tried and found effective in plant use.

The devices were originally part of a safety gadget show presented during the chemical sessions of the 1953 National Safety Congress. Although designed for use in chemical plants, the devices have application in other industries as well.

Most of the devices are not commercially available, having been thought up and constructed by plant personnel to meet some particular hazard.

Each idea is illustrated with a large photograph which shows clearly the details of construction. The text ac-

companying the pictures gives other pertinent data.

"Safety Devices and Ideas" is available for $1.25 to council members and $2.50 to others.

V V

"The lack of wealth is easily repaired; but the poverty of the soul is irreparable."—MONTAIGNE.

V V

"It is not the greatness of a man's means that makes him independent, so much as the smallness of his wants."—COBBETT.

PLANT MAN'S NOTEBOOK

Continued from page 23

its wire line rights-of-way with chemicals from an airplane to provide brush control. There is every indication that this method will prove satisfactory in that region and it is more economical than surface spraying. In this isolated region, crop damage need not be considered.

We took a side trip with the U. S. Air Force from Anchorage to Kodiak. This is the start of the Aleutian Islands and is famous for the size of its bear. However, we saw only one bear from the air and he was too far away to get a shot at even with a camera. We also saw some seals playing in the water near the landing strip. One point of interest here is the old Greek-Russian Orthodox church.

When we had finished in Anchorage, we boarded a DC-4 of Pacific Northwest Airlines for Juneau and there changed for Pan-American into Seattle.

We rode United from Seattle to San Francisco and after a few days in that air-conditioned city we boarded a DC-7 on American Airlines for Tulsa, Okla.,

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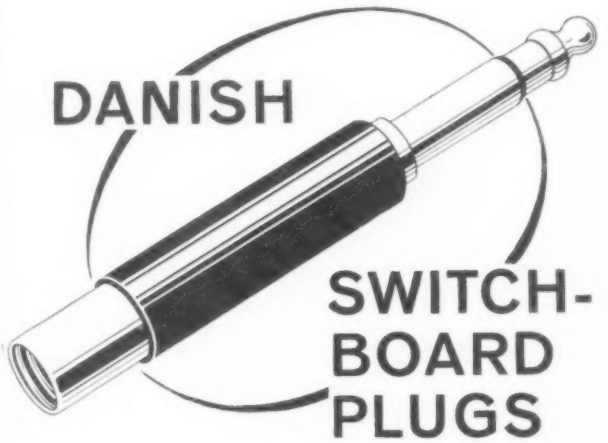

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where we boarded another plane for Washington, and home.

Alaska certainly makes efficient use of air transportation. Many sections cannot be reached by any other means. We have heard a lot about the bush pilots and some think they are a harem-scarem bunch. This is far from the truth as they play safe at all times and never take unnecessary chances. I rode in the co-pilot's seat on several flights and as I carried two Leica cameras, one for black and white and one for color, they suspected that I was interested in pictures. They were most helpful in pointing out good shots and if I missed a picture on the first time over, they would circle the scene again and sometimes drop down to a lower level so that I could get a better shot. These bush pilots are "tops" in our estimation and they undoubtedly have contributed much to the progress made to date in Alaska.

Our next Alaskan trip is planned for sometime during the winter months. I want to wear a parka and bunny boots. We hope to tell you about that trip at a later date.

THE OPERATOR'S CORNER

Concluded from page 24

good fellowship. They are something the individual has worked and strived for, whether it be the first or the 50th anniversary. Any recognition received on such an occasion is greatly appreciated.

If anyone in your office is having an anniversary, and you are aware of it, and no special program is arranged for the occasion, why not offer your congratulations and good wishes and let your co-worker know that you are aware that this is a "special day." I am sure it will make your co-worker happy to have you remember.

Speaking of remembrance, why not keep in mind your former co-workers who have retired from active service and who are so frequently forgotten? A telephone call, or a personal one, will make them very happy.

Just to talk to someone still actively engaged in the telephone industry will make them very glad, indeed. They may be gone, but they still remember the happy days when they, too, were working at the switchboard or supervising, instructing, etc. Our friends in the industry may retire, but they shall always be with us as long as our hearts remember.

Traffic Questions

(1) When an operator calls time on an outward call, what other action should be taken?

(2) What should the operator say when she notifies on time?

(3) If the operator is late in notifying on an outward call, how should she proceed?

(4) Should an operator cut out as soon as she has given notification on a call?

(5) If conversation continues after notification has been given, what entry should be made on the toll ticket?

Answers are presented on page 49.

CORRECTION

Answer to question No. 1 of "The Operator's Corner" (TELEPHONY, May 15, p. 44) should have read:

"If NC is encountered over tandem trunks or over circuits to an intermediate office (dial or ring-down), make two additional attempts at approximately 30 and 60 seconds before giving the NC report and releasing the customer. Make two more attempts at approximately 5 and 10 minutes before releasing the calling line and sending ticket to TX."

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Offer Prize for Oldest Holtzer-Cabot Motor in Use

The Holtzer-Cabot Divisions of the National Pneumatic Co., Inc., 125 Amory St., Boston 19, Mass., are offering a $100 reward for information on the oldest Holtzer-Cabot motor generator set still in operation in the telephone industry.

From responses to the reward offer the company hopes to complete its records of early motors designed and built by Holtzer-Cabot Electric Co.

This company was founded in 1875 by the late Charles W. Holtzer, a pioneer in the development of electrical apparatus and telephone equipment. In 1889, it became the Holtzer-Cabot Electric Co. and in 1949 was merged with National Pneumatic Co., Inc.

Today, National Pneumatic Co., Inc., and Holtzer-Cabot Divisions are manufacturers of fractional horsepower motors for standard and special applications. In recent years, the company has done research and development work on the commercial introduction of variable speed capacitor motors; certain types of rotary telephone ringing apparatus, including permanent magnet generators in particular; aircraft inverters, sub-fractional HP synchronous gear-motors, and quiet-operating single phase motors.

It has also pioneered in the design and manufacture of special sub-fractional HP motors for instrument and servo applications.

Answers To Traffic Questions On Page 48

(1) The ticket should be stamped lightly, or if the operator is not using a calculagraph, the time should be noted in the space for reports, and, in either case, encircle "Nfy (no.)" in the "Special Instruction" space.

(2) If you notify on time, at the end of the specified period or within the timing allowance thereafter, say for example "It is now three minutes."

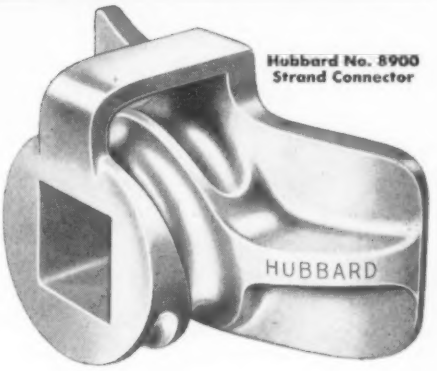
(3) If you are late in notifying, say for example, "I am sorry I couldn't notify you earlier. It is now four minutes," and enter "Nf'd late" in the space for reports.

(4) Yes, unless there is no switchhook supervision from the calling telephone. In that case, monitor long enough to determine whether the parties intend to continue conversation.

(5) Enter "continued tlk" in the space for reports.

HUBBARD STRAND CONNECTOR

The Hubbard No. 8900 Strand Connector was developed to provide a means for connecting the ends of telephone cable messengers at the pole, and is universally used by the largest telephone companies. It is used especially in connection with the installation of cable rings. It eliminates connecting messengers in the middle of the span and provides an efficient and safer means of support. Cable spinning equipment will not pass over the mid-span connections, therefore the No. 8900 is essential for all cable spinning installations.



Hubbard No. 8900 Strand Connector

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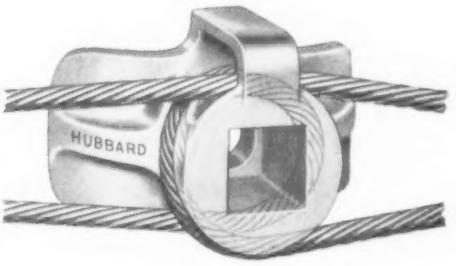

Phantom view showing how Messengers are installed on the Hubbard No. 8900 Strand Connector

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OVERHEAD

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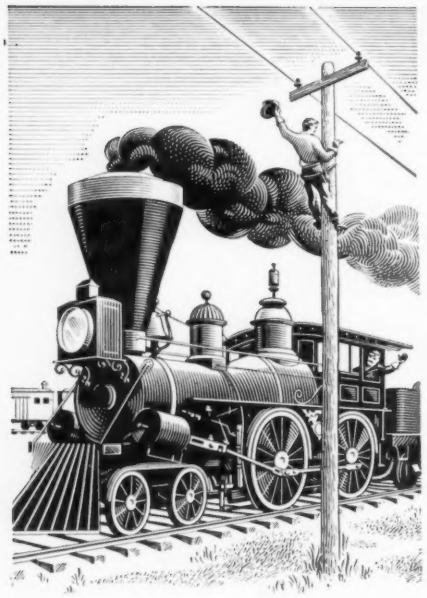

"Faster Freight"

In 1851, Erie Railroad became the first railroad to use telegraphic communications in dispatching trains. This method eliminated many hours of delay at passing points in the single track railroading of that day. Its success led to adoption of the telephone system for dispatching trains now in general railroad practice.

It was in this same era that the first Hemingray Glass insulators were made. Through constant research and development they have kept pace with the communication industries of the world.

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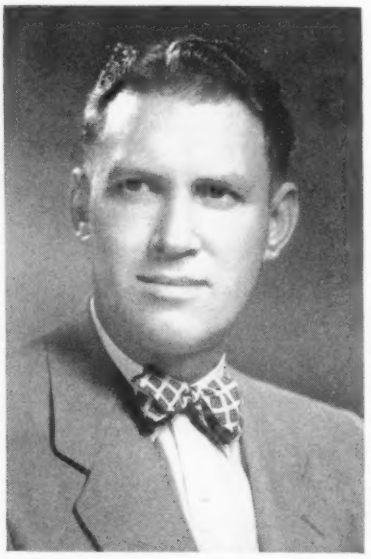
Kellogg Names A. N. Clark To Head Western Division

Appointment of A. N. Clark as western division manager for Kellogg Switchboard & Supply Co., with headquarters in Kansas City, Mo., has been announced by O. C. Bailey, assistant sales manager for the company.

Mr. Clark, who has been associated with the Kellogg organization since



A. N. CLARK

1951, moves to his new post from Portland, Ore., where he has been Kellogg district manager. Prior to his Portland assignment he served as a Kellogg field representative in Wisconsin.

He joined the company as senior engineer for manual switchboards following 16 years of extensive engineering experience with Interstate Telegraph Co. and Pacific Telephone & Telegraph Co. An alumnus of McKinley-Roosevelt Foundation, University of California and LaSalle Extension University, he has a Bachelor's Degree in Electrical Engineering.

V V

Graybar Names Manager

W. C. John has been appointed manager of the Roanoke, Va., branch of the Graybar Electric Co., Richmond, Va., District Manager L. G. Fields recently announced. He succeeds W. E. James who was made manager, power apparatus sales, at Richmond.

V V

"With Benjamin Franklin, we say: 'When men are employed, they are best contented; for on the days they worked they were good-natured and cheerful, and, with the consciousness of having done a good day's work, they spent the evening jollily; but on the idle days they were mutinous and quarrelsome.' If we think on this, we appreciate it the more."—Boonton (N. J.) *Times Bulletin*.

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FLASHES AND PLUGS

INSTRUMENTAL PEOPLE. According to Dr. Silvan S. Tomkins of Princeton University who recently addressed the Fourteenth International Congress of Psychology meeting in Montreal, Canada, it is not man's ability to use language that gives him his superiority over the lower animals.

Instead, man owes his ability to talk to the superiority of his nervous system.

In fact, Dr. Tomkins explained, a human being can best be understood as an intercommunication system for the reception, transmission, translation and transformation of messages, conscious and unconscious.—*Science News Letter.*

• • •

PARKING WORRIES. Columnist Gordon Gammack, writing in the Des Moines (Iowa) *Tribune*, recently told the following story which we quote below:

When a Des Moines man drove home one evening, he found his driveway partly blocked up by another car—enough so that he couldn't get to his garage.

Considerably irritated, he parked directly behind the other car, so that his car, too, was partly in front of the driveway and then he telephoned a complaint to the police.

The police said they'd take care of the situation.

But by the time the police arrived, the offending parker had driven off and the hapless home owner got the ticket for parking in front of his own driveway.

• • •

SHOCKING SITUATION. Columnist George Dixon, writing his *Washington (D. C.) Scene*, recently published the following story which we quote below:

This is straight from the maintenance reports of the Chesapeake & Potomac Telephone Co., which have no truck with fiction or fantasy:

A woman subscriber in nearby Chevy Chase complained that friends were calling her frequently, but that half the time her telephone bell didn't ring.

A repairman went out. He ran a series of tests and said he could find nothing wrong.

"That's what you say," retorted the woman, "but when a lot of my friends call, the bell doesn't ring."

"If it doesn't ring," argued the repairman, "how do you know they're calling?"

"Because my dog barks. He'll start barking like mad. There won't be a sound from the telephone, but when I lift the receiver, someone will be calling."

The telephone man shook his head, but nevertheless he proceeded to go over the wiring inch by inch. Finally he cried:

"Lady, I owe you an apology! You weren't having hallucinations!"

The repairman explained:

"Lady, your telephone wire is grounded to this iron post here in the yard. Your dog's chain runs from the same post.

"The juice that should go to ring the bell goes down the chain and shocks your dog. The bell doesn't make any sound, but your dog does."

CIRCULATION

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Telephony

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July 31, 1954

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★ ★ ★ IN THE ★ ★ ★ NATION'S CAPITAL

by FRANCIS X. WELCH WASHINGTON EDITOR

Explains provisions in general tax revision bill of special interest to telephone companies. No change in securities registration exemption. Wage-hour division to seek increase in switchboard operator "learner" pay rates. Commission on International Telecommunications about to be formed.

SUBJECT TO some possible last minute revisions by joint House and Senate action, the conference report on the general tax revision bill represents, on the whole, quite a victory for the Eisenhower administration. This ponderously big bill, completely overhauling the U. S. Internal Revenue Code for the first time in many years, contains many changes and features of special interest to public utilities, including telephone companies.

These particular provisions may be classified under six headings:

(1) Income taxes on corporate dividends paid to shareholders.
(2) Deduction allowable for depreciation from income (for tax purposes) on business plant and properties.
(3) Depletion allowance—of special interest to natural gas utilities.
(4) Corporate income tax rates.
(5) Corporate pay-as-you-go requirements.
(6) Consolidated returns.

There are doubtless other provisions of passing concern to utility company taxpayers, such as the liberalized "carryback" provisions for balancing good years against bad, and the liberalized pension trust fund deductions. But the foregoing six categories were the main items of moment to public utility companies, as such.

All told, the conference did a heroic job of compromising over 500 points of disagreement between the House and Senate versions of the bill. Most if not all of these conference report recommendations are likely to prevail in the new tax law as it reaches the President's desk. But a battle still looms on some of them—particularly the dividend tax relief, on which Senator Johnson (D., Colo.) has promised a fight to the finish before the Senate accepts. Chances are the conference recommendations will win out on this point also; but that seems to be the only one of the six items listed above which is in for real trouble. With this reservation in mind, let us look over the conference report on these six sections:

Dividend Relief: The conference recommended that taxpayers owning corporation stock may exclude from their gross income, dividends received after July 31, 1954, from the stock up to $50. On the remainder they may take a credit against tax liability of 4 per cent, up to a limit of 2 per cent of their taxable income in 1954 and of 4 per cent of their taxable income in later years. This is less liberal than the House provided, but a little better than the Senate voted.

Depreciation: In addition to the straight-line method of depreciation, the unit-of-production method and the declining-balance limited to 150 per cent of the corresponding straight-line rate, which are allowed by existing law, the new code allows the 200 per cent declining-balance, as well as the "sum-of-the-years'-digits" method, and any other reasonable method used consistently by the taxpayer.

The double declining-balance employs a complicated mathematical formula, the effect of which is to provide a much faster write-off on plant and equipment expenses in the early years.

The sum-of-the-years'-digits method, also based on an involved fixed formula, provides a similar pattern of depreciation to that produced by double declining-balance, but avoids one disadvantage of the latter: namely, the 10 to 13 per cent of cost always left unrecovered under the declining-balance scheme at the end of service life.

The new code specifically permits the taxpayer the option to switch from declining-balance to straight-line depreciation at any time during the life of a property.

The new depreciation methods with their fast write-off features may be used only on assets having a service life of at least three years.

They may be applied only on construction completed and first put into use after Dec. 31, 1953, in the case of construction begun and completed after that date; the new method is available only with respect to the position completed after that date. The new rules are specifically made available to depreciable mine improvements.

Depletion Allowance: The present allowance of 27½ per cent deduction from the income received from gas or oilwells or other wasting mineral resources will be continued without change. The purpose is to encourage wildcatting and other investment in gas and oil exploration to increase the nation's gas and petroleum reserves.

Corporate Taxation: The tax rate for corporations is maintained at 52 per cent for one more year, after which it will automatically fall back to the pre-Korean War 47 per cent rate.

Corporate Pay-As-You-Go: Corporations whose annual tax liability is $100,000 or greater for years beginning after Dec. 31, 1954, are required to pay instalments of 5 per cent of estimated tax (less credits and $100,000 exemptions) on the 15th days of the ninth and 12th months of their tax year. The percentage rises to 10 per cent in the second year the code is in effect, and continues to rise 5 per cent each year to the ceiling of 25 per cent in 1959 and each year thereafter.

Thus, in effect, these top-earning corporations will be paying half their tax liability during the year in which the earnings were made, and half in the first six months of the following year.

Consolidated Returns: A proposal by the House to write into the statute *all* the regulations on consolidated returns was rejected. Present law is maintained, with a few changes. But one change is very important to affiliated utility companies such as the Bell and

General telephone system operations. *The 2 per cent surtax on regulated public utilities is eliminated, but will still apply on non-regulated public utilities. A corporation leasing railroad properties, or a specified common parent is to be considered a regulated public utility and exempt from the surtax.*

The 95 per cent intercorporate stock ownership test for joining in the filing of consolidated returns is reduced to 80 per cent.

Specific alternative rules are provided for allocating earnings and profits among members of an affiliated group for purposes of sharing tax liability.

No Gain on Security Exemption

Despite a game effort by the United States Independent Telephone Association, as well as other representatives of smaller business enterprise, a House-Senate conference has decided to do nothing this year about the delay and expense of the Securities & Exchange Commission registration of small security issues.

The Senate provision in the bill to amend the Securities Act provided for exemption of small issues of securities up to $500,000. This has been dropped in favor of the House version providing exemption of up to $300,000. This means no change in the status of such exemption from present law, and no further relief for smaller companies seeking to avoid the expense and delay of registering their issues with the Securities & Exchange Commission. The bill does not amend the Public Utility Holding Company Act.

The Wage-Hour Learner Rates

The wage-hour division of the Department of Labor has announced its intention to boost "learner" rates for telephone switchboard operators to 67½ cents and 72½ cents an hour. At present, the minimum rates are 60 cents and 65 cents an hour. The CWA-CIO telephone union has complained that this increase will not match other pay boosts in the industry since the present learner rates were established in January, 1950. The union called on the wage-hour administrator to discontinue telephone operator learner rates altogether. But the administrator has so far refused to do so.

The number of certificates, applied for by telephone companies, to use the learner rates has been dropping off steadily in recent years. But USITA protested to the wage-hour administrator when he threatened to cut out the learner rate setup entirely, several weeks ago. USITA claims that the restrictive provisions of the wage-hour rates are responsible for telephone companies failing to use them. It was urged upon the wage-hour administrator that there is a continuing need for such wage differentials in the case of apprentice operators, who would otherwise have to be paid full minimum standard wages during a learning period when their work is not productive.

A New International Communications Commission

On July 19, the House of Representatives passed and sent to the White

(Please turn to page 40)

REA Approves Telephone Loans in Four States

The first Rural Electrification Administration loans of the new 1955 fiscal year for improving and extending rural telephone service went to Illinois, Oregon, Utah and Washington, the U. S. Department of Agriculture announced on July 20. Details of the loans made during the week July 12-16 and which amounted to $361,000, are given below:

Bath (Ill.) Telephone Co. was allocated $178,000 on July 14 to finance the improvement and extension of rural telephone service in Mason County.

This company is presently furnishing magneto service to 328 subscribers and 14 switch stations. With the loan funds, the borrower plans to convert the Bath and Kilbourne central offices to dial operation, rebuild 85 miles of the existing line and construct 11 miles of new line.

These changes will enable the company to provide improved service to the existing subscribers and initial service to 118 rural families now without telephones. In addition, the borrower plans to continue serving the 14 switched stations. The completed system will consist of 118 miles of line. Kenneth Blodgett is president and manager of the Bath Telephone Co.

* * *

Clear Creek Mutual Telephone Company, Oregon City, Ore.: $83,000 on July 14, second loan to this borrower.

With these funds, the Clear Creek company will be able to provide facilities, including 16 miles of additional line, to serve 52 subscribers who were not included in the original loan. The new loan will also cover increased construction costs involved since the first loan of $134,000 was approved in May, 1953.

The two REA loans will make possible new and improved service over 93 miles of line to 532 subscribers in Clackamas County. Dial central office facilities for the system are located at Redland. Earl Linkins is president of the Clear Creek Co.

* * *

Emery County Farmers Union Telephone Association, Inc., Orangeville, Utah: $50,000 on July 14, third loan to this borrower.

The loan funds will be used by the borrower to provide facilities, including four additional miles of line, to serve 54 subscribers who were not included in the previous loans.

The three REA loans, totaling $375,000, will enable the Emery County association to bring new and improved service to 854 subscribers. Since the previous loans were approved, the Emery County association has cut over all of its central offices to dial operation, and around 500 subscribers are now receiving dial service. The offices are located at Cleveland, Castle Dale, Ferron and Emery.

The completed system will consist of 213 miles of line in Emery County. Dennis L. Killian is president and Keith N. Ware is manager of the Emery County association.

* * *

Cohasset Beach Telephone Co., Aberdeen, Wash., $50,000 on July 16, third loan to this borrower.

These loan funds were necessary on account of changes in the system design, and also to provide facilities to serve 58 subscribers not included in prior loans.

The three REA loans to this borrower, totaling $221,000, will enable the Cohasset Beach company to serve 658 subscribers in Grays Harbor and Pacific counties. Dial central offices for the system will be located at Grayland and Westport. Subscribers will be able to call between the two exchange areas without toll charge.

The completed system will consist of 55 miles of line. R. H. Mumaw is president and manager of the Cohasset Beach Telephone Co.

The OPERATOR'S CORNER

by MAYME WORKMAN, Traffic Editor

IF YOU REMAIN calm when the traffic load soars, if you don't take your office problems home nor your family problems to the office, if you don't worry about your health, your bank balance, or whatever else seems handy, don't bother to read this article —it doesn't apply to you!

Nervous tension and worry are killers. Constant nervous strain results in indigestion, high temperature, insomnia, rapid heart beat, difficulty in swallowing, ulcers, headache, and high blood pressure.

The total results—premature old age which in most cases could be prevented.

Americans with their mile-a-minute living habits are prone to overwork, overworry, and overeat. But the human body can stand just so much strain. Then something gives.

There are many ways to fight back at the destructive worry habit. All of them require diligence and repetition. For tension is a habit, and to conquer it we must develop new habits.

Have you ever observed an operator making hard work of her job because she is tense, while an operator near her is working very calmly and accomplishing so much more with greater ease?

The best time to relax is as soon as you feel fatigued. It takes but a moment to stretch your arms and legs, and let your muscles go limp. A well-known doctor dropped a man's blood pressure from 185 to 145 merely by teaching him to take things easy.

Good music is a tonic that relaxes and strengthens the chronic worrier. A dose of the second movement of Beethoven's Fifth Symphony taken whenever nerves begin to fray will work wonders.

Relaxation doesn't necessarily mean stopping work and lying down for a rest. There's such a thing as "active relaxation"—continuing whatever you are doing, but doing it gracefully, easily, and with no more muscle tension than is really needed.

Scientists say you can even drive a car or vacuum a carpet, and still be relaxed. I'm confident if they were familiar with our business they would add, "or operate a switchboard."

Many people are made unnecessarily tense by poor posture, wasted motion, and muscles that are held steel-stiff. Even at rest, these muscles can burn energy just as though they were in violent movement.

Barnard College in New York gives its girls a special course in relaxation. A good part of that course is learning how to loosen tension-taut muscles.

Two operators may work side by side for a given number of hours, each handling approximately the same number of calls. But when they go off duty, one may feel perfectly relaxed and ready for a pleasant evening while the other may be so tired all she can think of is to get home and rest for the remainder of the day. The difference lies in the manner in which they have worked.

The following are guideposts to more relaxed living:

(1) Break the hurry habit — take things easier.

(2) Forget about keeping up with the Joneses. The Joneses may have ulcers as well as Cadillacs.

(3) Give your mind and body some daytime rest periods. Read the Bible or listen to some good music for fast refreshment.

(4) Work consciously toward achieving peace of mind by removing or getting away from contention at work or at home.

(5) Recognize your limits as a human being. Don't take on more responsibilities than you can handle without constant worry.

(6) Eat lightly one day a week.

(7) Let your recreation be simple and relaxing so that your tired nerves really get the chance to "re-create" themselves.

Learning to relax after years of tension and worry is not easy, but the reward is a calmer and happier life.

A friend of mine who is inclined to worry remarked, "The water shortage throughout the nation is becoming acute. People just don't realize how bad the situation is. I wouldn't be surprised if the whole world would burn up some day."

Well, maybe it will, but I for one am not going to worry about it. What is to be, will be, and all the worriers in the world will not change it.

Traffic Questions

(1) How can an automatic answering set connection be recognized?

(2) When such a call has been identified, how is it designated?

(3) On a person-to-person call to an automatic answering set with or without message recording, how should the subsequent attempt time be determined?

(4) On a collect call, if a mechanical answer is received, should this be considered as a refusal to accept charges?

(5) When a customer, receiving a mechanical answer, claims no satisfaction was obtained on a station call, should the operator refer the call to her supervisor or service assistant?

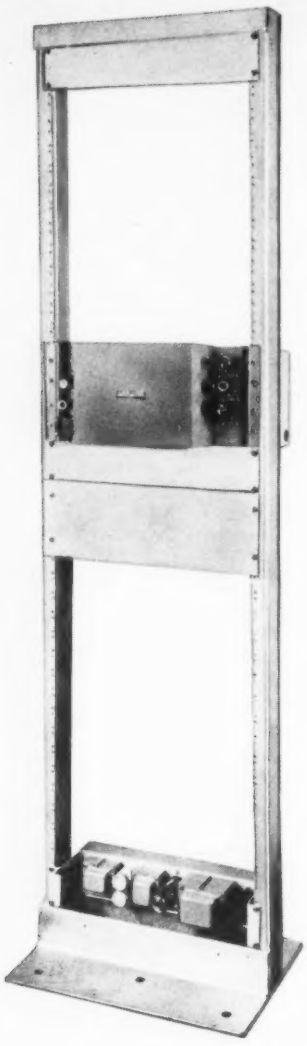
Answers are presented on page 46.

V V

Tennessee Company Has Option To Buy Another

W. S. Howard, president of the Millington (Tenn.) Telephone Co., Inc., and E. G. Baird, owner and operator of the Munford (Tenn.) Telephone Co., recently announced that an option has been given to the Millington company for purchase of the Munford exchange.

The Millington company plans to obtain a Rural Electrification Administration loan in order to rebuild the existing facilities at Munford, to extend telephone service into unserved areas and to convert the Munford exchange to dial.



A stackable carrier system. (Photo courtesy of Stromberg-Carlson Co.)

CARRIER SYSTEMS

Part 2—Tuned Circuits

By HAROLD B. McKAY

OF ALL THE many components of a carrier system, the greatest precision and the most expense is involved in the filters and tuned circuits. These units are also probably the most difficult in which to locate trouble by ordinary means.

To fully understand the operation of tuned circuits an understanding of their component parts is necessary. Though, again, we have nothing but coils and condensers, a new viewpoint of these parts may be necessary in order to develop a concept of how they work together.

The Condenser

The condenser, or capacitor as it is called in later usage, consists of two metal plates separated by an insulator. The metal plates may be foil, the insulator air, mica, plastic or paper.

We ordinarily think of a condenser as a device which will pass alternating current, but block direct current. This is not correct, but it is a handy way of analyzing some circuits. This conception probably comes from the fact that dc and ac electricity is usually taught as different subjects, as though it were two different things. It is better to regard dc as alternating current of zero frequency, because the same rules apply.

Actually a condenser doesn't pass any kind of current, because it is open —the two conductors are separated by the insulator, or dielectric as it is also called.

What happens in a condenser is actually an application of the old experiment wherein a stick of sealing wax is rubbed with a piece of wool until it becomes charged. It will then attract and pick up bits of paper from the table. It does this because the strong charge on the wax induces an *opposite* charge on the bits of paper, and they are attracted.

When voltage is applied to a condenser a charge is built up on the opposite plate, even though there is an insulator between the plates. Current flows into, but not through the condenser as the voltage charge is built up. This charge can later be discharged, hence it may appear that current has been made to flow through the condenser. If dc is connected to the condenser, a single charge will be built up, and that's it. When it is charged, there is nothing more that can happen. If alternating current is applied, the condenser will be repeatedly charged and discharged and current apparently flows through the condenser.

The fact that current flows when dc charges a condenser is well known to anyone who has worked on a local test desk. When a tester connects to a telephone line, his meter shows a condenser kick if the line is closed. This meter movement is caused by the dc flowing into the condenser. One kick only results, but current *does* flow. If the tester continues to reverse the battery, simulating alternating current, the meter will continue to "kick," but this is merely prolonging the thing that happened on the first dc connection to the line.

Time Factor

Just how much current flows into a condenser depends upon its capacity and upon the voltage applied. This brings up some interesting aspects of condenser operation. First of all, to charge a condenser takes time; it doesn't happen instantaneously. How much time depends again upon the applied voltage and the capacity.

When voltage is first applied to a condenser, the effect is the same as if a short circuit were applied to a line—the voltage of the line drops to zero, the current flow rises to maximum. As current flows into the condenser a voltage builds up on the plate. Note that this voltage will be of the same polarity as the applied voltage. As this condenser voltage rises, it opposes the applied voltage, which causes a reduction in the current flow.

This is often referred to as an equal and opposite voltage. However, it is not opposite, but rather opposing. Like poles oppose each other; the polarity on the condenser and on the line is the same, so the voltages oppose.

It can be seen from this that the rate of charge is not uniform; that the current flow gradually tapers off until the voltage on the condenser is approximately equal to the line voltage, at which time the current flow stops.

The important thing to remember about all this is that if a condenser is in a circuit, the full effect of the applied voltage will not be felt in the circuit beyond until the condenser is charged. It is much like damming up a stream; no water will flow past the dam until it is filled.

This feature is important in circuits where time or delay are involved, such as in condenser-timed pulsing relays in some step-by-step equipment. It is also

used in carrier and radio circuits in a much less obvious manner.

It has been pointed out that when the condenser is first connected, the maximum current occurs at minimum or zero voltage. This constitutes a "phase shift" in that the voltage and amperage are not available at the same time. In this case it is said that the amperage "leads" the voltage because it flows first. The power companies call this condition "leading power factor."

Experiment

A simple experiment can be performed by hooking up a condenser, resistor and neon lamp, as shown in *Fig. 7*. The battery supply can be a 100-volt radio "B" battery; the neon lamp should be of the miniature baseless type which has no internal resistor. (Neon night lights will not work.)

By proper choice of resistor and condenser sizes, this lamp can be made to flash at any rate from several thousand times a second to once every few minutes or longer.

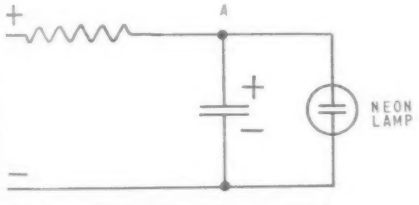
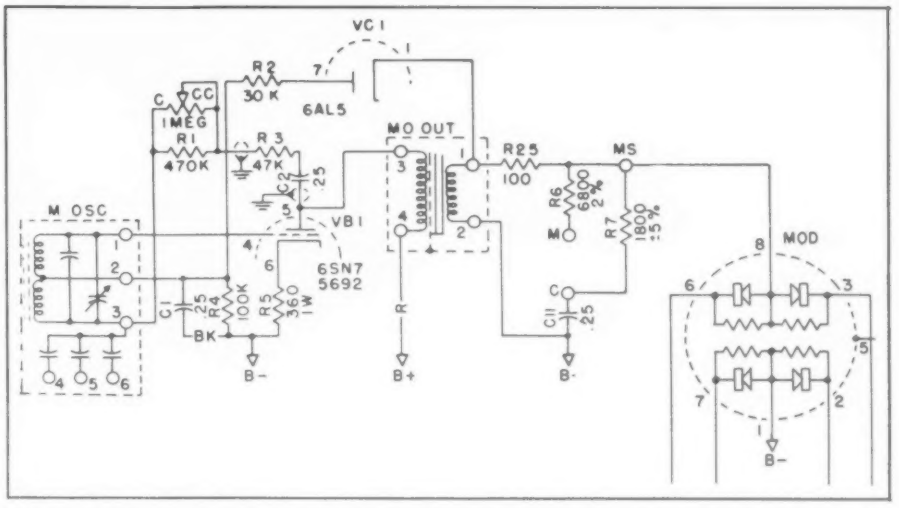


Fig. 7 - **Circuit for demonstrating condenser action.**

The circuit works like this: The neon lamp is normally open circuit inside. When the applied voltage reaches about 60 to 70 volts, the lamp will "fire," or suddenly conduct electricity and light up.

In this circuit, current flows through the resistor into the condenser. The condenser at first has zero volts, and acts like a short; a large voltage drop occurs across the resistance, as the heavy current flows. At this moment no voltage is available to reach the lamp. As the condenser builds up its charge its voltage increases; this opposes the battery voltage and cuts down the current flow. As the current decreases, the voltage drop in the resistor decreases, and more of the line voltage becomes available at point A. This further charges the condenser. The voltage at point A starts at zero when the battery is first connected, then gradually rises. It would ultimately reach the battery voltage if the neon lamp were not in the circuit.

Instead, when the voltage reaches the firing point of the lamp, the lamp conducts current, and discharges the condenser. The cycle then repeats. The time interval of the cycle is determined by the applied voltage, the size of the resistor and the capacity of the condenser. The more resistance or the more capacity, the slower the frequency of the cycle. This experiment demonstrates that the condenser voltage builds up gradually, and that no voltage gets past the condenser until it is charged.



This carrier frequency selective filter is used on a subscriber line carrier system. It employs ferrite cup and slug type coils instead of toroids, but achieves same performance. (Drawing courtesy of McElroy Mfg. Co.)

This little circuit can be modified to operate a relay, and thus serve as an interrupter at low frequencies, or it can be used as a tone source at audio frequencies.

From this experiment it might be inferred that small condensers are associated with high frequencies, while large condensers go with low frequencies. This is a correct association of ideas.

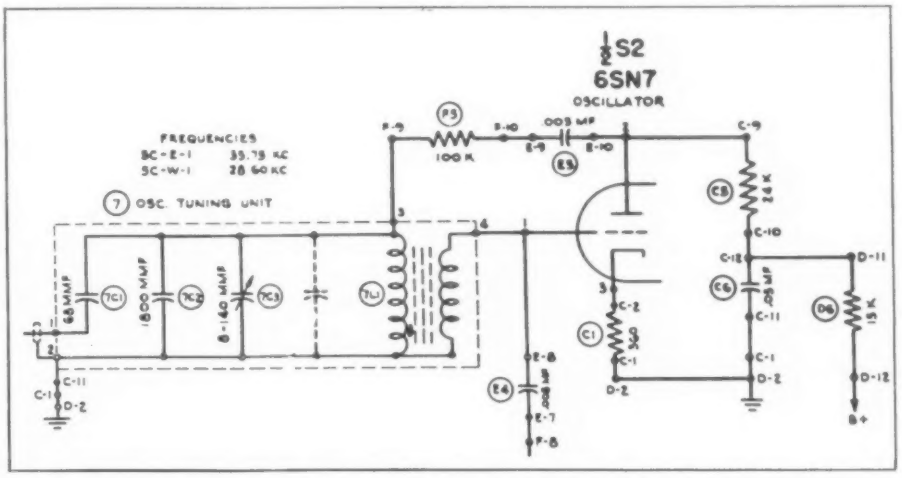
It is well to remember that a little condenser can be charged and discharged quickly, hence will be found associated with high frequency currents, while the large capacitor finds its use in low frequencies. Thus the power supply filters in a radio set or carrier, which pass 60-cycle current, may be 20 to 50 microfarads, while filters on power line carrier systems, which must pass the high carrier frequency but block the 60-cycle, may be a few micromicrofarads in size.

From the foregoing we may conclude that the amount of current a condenser will seem to pass increases as the voltage or the frequency increases.

The Inductance

In radio as in telephone work, an inductance is a coil of wire of some kind. It is sometimes regarded as a device which will pass dc, but reject ac. Again as in the case of the condenser, this is not quite correct. Actually, the telephone man's expression of "retardation coil" is probably more descriptive of the thing that happens, than is "choke coil" or "inductance."

When current flows in a coil of wire, a magnetic field is built up around each turn of the wire. This magnetism affects the turns next to it, and causes a new current flow in that wire, independent of the current which is flowing into the coil from the outside. This is the same action that occurs in a transformer, and the action between the



An actual oscillator circuit as used in a carrier is shown here. Notice that a transformer, rather than a single winding coil, is used. Compare this with the basic oscillator circuit in Fig. 12. (Courtesy Kellogg Switchboard & Supply Co.)

turns of wire is just the same as if one turn of wire was a primary winding and the one next to it a secondary winding.

This current that is built up in the wire by the magnetism, like the voltage on a condenser, is of the same polarity as the applied current, therefore it opposes the current flow. By such opposition it retards the current flow—hence the name "retard coil."

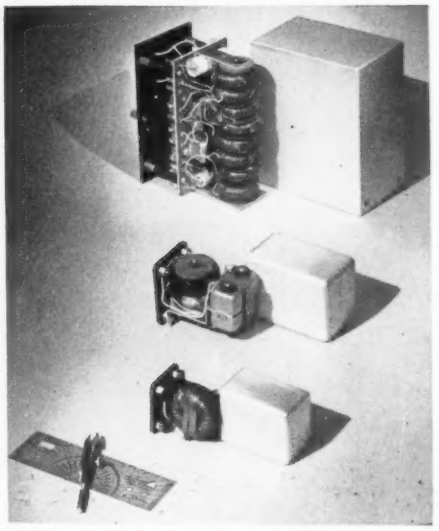
Unlike a condenser, a coil will not hold its charge. The applied current results in a magnetic field around the coil, but once the current is removed, this field collapses, and a single spurt of current is available from the winding if there is a circuit to receive it. It is this spurt which causes sparking at contacts when the circuit is broken on an inductance.

When dc is first applied to a coil, this magnetic effect opposes the current, only while the current is building up. A magnetic field only generates current when something is moving, like the armature in a magneto, or when the field itself is changing strength.

Therefore, with dc, opposition is encountered while the current is increasing from zero in the coil. Once the current reaches maximum, no further opposition is encountered, and the current flows freely.

If alternating current is applied, the magnetic field is constantly changing because the applied current is changing. Therefore the coil constantly opposes the ac. However, it should be noted that some ac does get through. The opposing current couldn't be generated unless some did.

It should be noted also that the build up and collapse of the opposing current takes time, just as charging a condenser takes time.



Many types of filters are used in carrier apparatus. They are made up of coils and condensers. The doughnut shaped coils shown above are called "toroids" and are highly efficient. (Photo courtesy of Lenkurt Electric Co.)

From this emerges a rule to remember. The more inductance in a coil, the less ac will pass through it; the higher the frequency, the less ac will pass through a coil. Notice that this is the opposite effect as that achieved with condensers.

Because it is the current flow that is retarded by a coil, the voltage is not reduced. Therefore, at the moment of connecting to a coil, the voltage is maximum, and the current zero. This also, is just the opposite to the effect of a condenser.

From these two opposite effects can be derived the whole basis of carrier and radio — circuits which can be turned to different frequencies.

Tuned Circuits

If a coil and condenser are connected together as shown in *Fig. 8* and connected to ac, the coil will tend to oppose the flow of current, and the condenser will tend to pass the current. If the frequency of the current is increased, the coil will increase its opposition, or reactance as it is called, and the condenser will lower its reactance.

If the frequency is lowered the coil will pass more current, the condenser less. So it may be said that this circuit will not pass either a high or low frequency.

But suppose some medium frequency is chosen. It has been shown that it takes a definite time for a condenser to charge and for a coil to build up its field. If a frequency could be chosen whose time between cycles was the exact time required by the condenser and coil to perform, an interesting thing results—the effect of the coil and condenser cancel each other out, and the circuit would act as though a dead short was across the line instead of the two components.

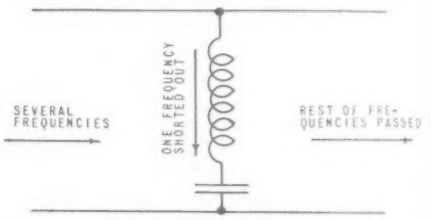
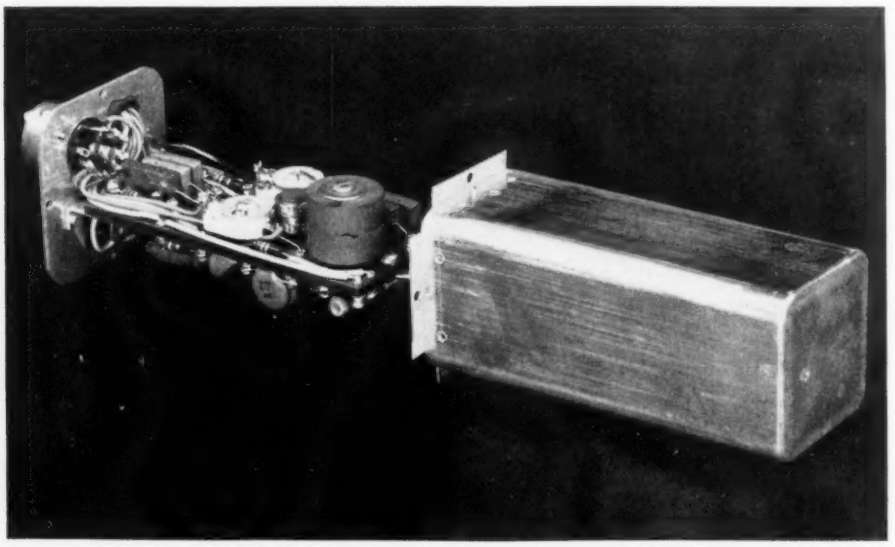


FIG. 8 - BAND REJECTION FILTER

This can perhaps be better understood by remembering that the condenser retards the voltage and advances the amperage, while the coil retards the amperage and advances the voltage. Thus, each component causes the effect of the other to become undone, and electrically they become a continuous conductor; that is, while each causes the current and voltage to become out of phase, or out of step, together they correct, or complement each other. All of which is an interesting principle in human relations as well as electricity.

When a coil and condenser are connected together as shown, and when the right frequency is applied to achieve the described result, a condition of "series resonance" is said to exist. Put another way, the circuit is resonant at a certain frequency.

This simple little circuit becomes the basis for one of the most critical units in a communications system—the band-rejection filter. It should be pointed out that while this circuit will act as a short circuit at a given frequency, it will not sharply change its behavior if the frequency is changed by a few cycles or even a few hundred cycles in some cases. Actually, if the frequency were changed gradually, the amount of



This reproduction of an actual carrier circuit shows the oscillator tube (6SN7) as well as the modulator crystal assembly to the right. Note that this circuit has all of the basic elements shown in Fig. 12. (Courtesy Lenkurt Electric Co.)

current passed by the circuit would taper off gradually. How rapidly this current would taper off is a measure of the band-pass, or sharpness of the circuit.

If a number of different frequencies were injected into this circuit from the ac source, the coil and condenser could be made to reject one of those frequencies by shorting it out. Higher frequencies would be blocked by the coil, lower ones by the condenser, so that these frequencies would not be shorted out.

Ringing Bridge

An often overlooked example of this series resonant circuit is the ringing bridge on a trunk, consisting of a condenser and a relay or ringer which is the coil. At the frequency of the ringing current, 20 cycles, the circuit passes enough current to ring the bell. It is limited only by the high resistance of the wire in the bell, which prevents it from short-circuiting and tripping the ringing. To voice currents, however, the ringer acts as a retard coil at the higher frequency, and prevents a loss of transmission.

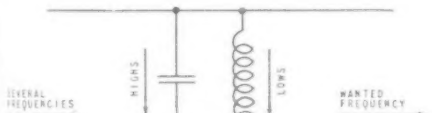


FIG. 9 - Band Pass filter, which is "tuned" to the wanted frequency. Higher frequencies are shorted out by the condenser, lower ones by the coil

Another method of connecting a coil and condenser is in parallel, as shown in *Fig. 9*. When this combination is resonant with the applied frequency, it reacts much as does the series resonant circuit except that instead of presenting a short circuit to the frequency it presents a very high impedance, or practically open circuit to the line.

However, at a lower frequency, the coil would tend to short out the current, and at a higher frequency the condenser would do the same.

From this parallel resonant circuit comes the band-pass filter, which every carrier requires. In this case, if a mixture of several frequencies were sent in from the ac source, all would be shorted out except the resonant or wanted frequency, which would go on undisturbed to be used in the circuit beyond.

Note that this is opposite in effect to the series circuit. The series circuit rejects one frequency and passes all others. The parallel circuit passes one frequency and rejects all others.

As with the series circuit, the parallel resonant hook-up does not sharply cease working if the frequency changes slightly, but tapers off gradually. However, in carrier work, frequencies carrying different conversations are very close together, and elaborate filters, containing many coils and condensers must be designed for sharp response.

Tuning

Bringing a circuit into resonance with the frequency of the current is called tuning the circuit. The circuit of a radio receiver is one of parallel resonance, and the user "tunes" the receiver to different frequencies of resonance by changing the capacity of the condenser with his dial. In carrier equipment, the tuned resonant circuits are usually precisely tuned at the factory and ordinarily do not require field adjustment.

High and Low Pass Filters

In the circuits shown above, the idea was to accept or reject one specific frequency. In carrier operation there are occasions where it is necessary to accept or reject all frequencies above or below a certain point. If high frequencies are to be passed, a "high-pass" filter is used. If low frequencies are to be passed and the highs rejected, a low pass filter is used.

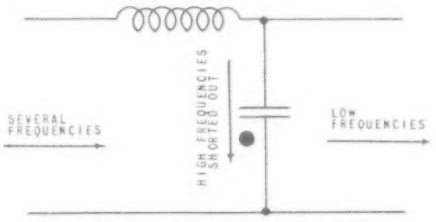


FIG. 10 - LOW PASS FILTER.

The same circuit elements are used to achieve this effect. *Fig. 10* shows a low-pass filter. If several frequencies enter the circuit from the ac source, the lower ones will pass through the coils most easily, and will not be shunted down by the condenser. The high frequencies will be retarded by the coil and will be shunted down by the condenser.

The reverse is true in the high-pass filter shown in *Fig. 11*. Here the highs go easily through the condenser, and are not shunted by the coil, while the lows are blocked by both.

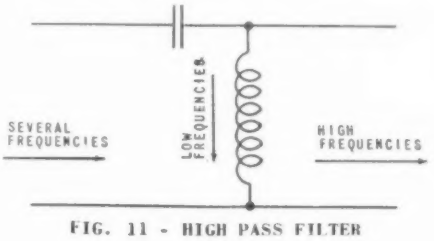


FIG. 11 - HIGH PASS FILTER

Another way of looking at this can make use of the concept that ac goes through condensers but not coils, and dc goes through coils but not condensers. Using this line of thought, and remembering that dc is zero frequency ac, then it follows that the closer ac becomes to dc (lower frequency), the more it behaves like dc in regard to coils and condensers. The higher the frequency, the more it becomes ac, and acts like ac in coils and condensers.

From the foregoing, it should be remembered that coils and condensers can be connected to pass or reject a definite range or band of frequencies. They also can be connected to pass or reject all frequencies above or below a certain definite frequency.

Oscillators

The properties of the coil-condenser resonant circuit can be utilized to make another device which is essential to carrier and radio equipment—the oscillator. An oscillator is a device which makes alternating current (of any desired frequency) from its direct current supply. As such, it may be regarded as an alternating current generator for purposes of studying a circuit diagram.

The operating principle of the oscillator, which consists of a tuned circuit and a vacuum tube, can be evolved by remembering the properties of the condenser and coil explained in the foregoing.

For instance, if a coil and condenser are connected in parallel, and a single spurt of dc connected across them and then removed, the following sequence of events will occur: The condenser will take most of the current because of its "leading" phase shift characteristic. The inductance, which lags in taking the current, will get little of it. When the dc is removed, the time lag in the coil will have passed and the coil will be ready to receive current. The condenser discharges, and its current flows into the coil. The coil builds up a magnetic field; when the current stops flowing from the condenser, the magnetic field of the coil collapses and sends current back into the condenser.

The current may be kicked back and forth like this for a few cycles, at a frequency which is determined by the size of both coil and condenser, as explained above in resonant circuits. This alternating current which circulates around in the two units soon stops, because of resistance losses in the circuit. This circulating effect, by which a definite, controllable ac current was generated from a pulse of dc, is called the "flywheel effect" in radio work. The condenser-coil combination is often called a tank circuit.

If a vacuum tube is connected to

(Please turn to page 36)

Glossary of Telephone Words and Terms

AUTHOR'S NOTE: This glossary comprises a list of words and terms which telephone company personnel encounter in their everyday work. Some of these terms may be completely unfamiliar to the new employe while other terms, seemingly familiar, will be found to have a special meaning peculiar to the telephone business. The definitions herein, while not always rigidly scientific, are as exact as practicable, considering the desirability of keeping them both short and simple. Slang terms were avoided where there was an alternate preferred expression. It is hoped that this glossary will be helpful to all telephone personnel, but more especially to those who are relatively new in the business.

Compiled by EMERSON C. SMITH

THIS IS the fifth and last installment of "Glossary of Telephone Terms." The first, second, third and fourth parts were published in the July 3, 10, 17 and 24 issues. Reprints of the complete glossary will be available, provided a sufficient volume is ordered to justify reprinting.

T

T. See **"Drawing."**

Tagging. Numbering identified pairs in cable splicing.

Tandem. Method of interconnecting central offices by trunks to a "Tandem" office when the central offices do not have trunks directly to each other.

Tap. A branch. Applies to conductors as "Battery Tap" and to miscellaneous general use.

Tap, Bridged. See **"Bridged Tap."**

Tape. Ribbon of flexible material. Many types are used, described by a qualifying adjective as "Friction Tape," "Lead Tape," "Muslin Tape," "CR Rubber Tape," etc.

Tariff. Definitions and rates for charges for services.

Telegraph. System of communication by coded signals. As used today in our business, hand sending and ear receiving is usually implied.

Telephone. Combination of apparatus for converting speech energy to electrical waves, transmitting the electrical energy to a distant point and there reconverting to audible sounds.

Telephoto. Transmission of pictures by wire.

Teletype. System of transmission of messages employing keyboard sending and type-printed reception over a distance.

Tension. (1) Mechanical—The condition of strain which tends to stretch; (2) electrical—a term meaning potential, or electrostatic voltage. Not properly applied to an alternating voltage.

Tent. Usual meaning of tent but employed in splicing operations over splicers, equipment and cables worked on or over a manhole in inclement weather.

Terminal, Aerial. Terminal connected to an aerial cable.

Terminal, Cable. Device to connect to a cable to bring out pairs and make them available for connection.

Terminal, Cut-Out. Numbered, designated pairs brought out of a cable at a terminal.

Terminal, L.D. Subscriber's line connecting directly to a long distance switchboard.

Terminal-Per-Line. System which uses only one connector terminal on a party line. The selection of the party is made within the connector which is a three-digit switch. One of the three digits selects the frequency of the desired party. Individual lines may be assigned in connector groups of this type.

Terminal-Per-Station. System which uses a connector terminal for each individual and PBX line—also for each party on a party line. A two-digit connector is used. Frequency selection is made by connector shelves or by special terminal-per-station connectors which use a 400-point bank for this purpose. Divided ringing using the same frequency may also be employed on two-party lines.

Terminal Repeater. Terminal repeater is an assemblage of equipment designed specifically for use at the end of a communication circuit, as contrasted with the repeater designed for an intermediate point.

Terminating, Termination. (1) Usual sense of ending. Applies to cables, conductors, circuits, etc., at the location where they end or change character; (2) connecting a circuit with a device which presents smooth impedance characteristics. The device used is a "Termination."

Test. Procedure or sequence of operations to determine the manner in which apparatus is functioning or the existence, type and location of trouble conditions.

Testboard. Switchboard equipped with apparatus for making tests and for temporary interconnection and rearrangement of circuits, usually toll circuits.

Test, Busy. Test or test feature to determine if circuits are available and may be taken for use.

Test Desk. In exchange testing, as distinguished from toll, a board with trunks to distributing frames and testing apparatus for testing subscribers' lines, switching trunks and cable pairs.

Thermistor. Temperature sensitive resistor employed in such a manner as to cause that property to perform some desired function.

Thump. Interference from a superimposed telegraph circuit heard in a telephone circuit.

Ticket, Cable Repair. Small printed form used to report pairs in trouble, nature of trouble and pair substitutions and materials needed for final repairs.

Ticket, Trouble. In toll testboard work, a small form for reporting any toll circuit condition which requires a testboardman's attention.

Ties. (1) Electrical connections or straps; (2) tie wires; (3) to hold—as a permanent does.

Tie Wires. Short pieces of wire used to tie open line wires to the insulator.

T.I.F. (Telephone Influence Factor). Reading obtained on "TIF meter" which gives a relative indication of the harmonic content of the voltage wave of the power circuit to which it is connected.

Tile. Baked clay or terra-cotta tube or duct placed underground for conducting cable; conduit.

Tile, Multiple. Several ducts combined in one tile structure.

Tile, Sewer. Common commercial cylindrical tile used as a conduit for cable.

Tile, Split. Partially round tile used to cover a cable already in place.

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Time, Answering. Time elapsed between the appearance of a signal and responding to it.

Time, Holding. Period of time a trunk or toll circuit is in use on a call including operator's time in connecting and customer's conversation.

Time of Day. Service whereby a customer can call a designated number and be informed of the clock time.

Tinned. Covered with metallic tin to permit soldering.

Tip. (1) The first of a pair of wires; (2) textile-insulated cable spliced to a paper insulated cable to permit it to be terminated, as on a distributing frame.

Tip, Silk and Cotton. Tip cable with conductors insulated with silk and cotton wrappings.

Tips, Spade. Notched flat metal strips connected to cord or wire ends to permit them to be held under binding screws.

Toll. (1) A charge made for a connection beyond an exchange boundary; (2) by extension, any part of telephone plant, circuits or service for which toll charges are made as, "Toll Testboard," "Toll Office," etc.

Tone, Sustained. (1) Audible sound. Many different tones, electrically generated and designed for special uses are employed in telephony; (2) Source of testing energy. The energy may, or may not, be calibrated with respect to level or frequency.

Tone, Busy-Back. Tone returned to a calling party to indicate that the called line is in use.

Tone, Dial. Tone indicating that the dial mechanism is ready to receive a number.

Tone, High Frequency. Inaudible tone used with a detector for identifying cable pairs without disturbing service.

Tone, Order. Tone sent over trunks to indicate that the trunk is ready to receive an order and to the receiving operator that she is about to receive an order.

Tone, Ringing. Tone sent a calling subscriber to indicate that the called line is being signaled.

Tone, Test. (1) Tone used in identifying circuits; (2) tone used for trouble locations; (3) source of testing energy.

Torch. Portable furnace used for heating and melting wax lead. Uses kerosene. Correct term is "Furnace."

Toroidal Coil. Coil wound on a closed ring core.

Train. Sequence of pieces of apparatus joined together to forward or complete a call.

Transfer (Cable). Physical work of moving a group of cable pairs from one count to another in the same cable or to a new count in a different cable.

Transformer. Device for receiving alternating currents in one winding ("primary") and repeating them at the same or a changed voltage into the second winding ("secondary") which is connected to another circuit. Used extensively in telephony for many purposes. Commonly called a "Repeating Coil."

Transformer Coupling. That interconnection between stages of an amplifier which employs a transformer for connecting the plate circuit of one stage to the grid circuit of the following stage.

Transistor. Tiny, efficient device using point or layer contacts on a germanium electrode. A small potential on the "control" electrode may control a relatively large current on the "plate" electrode.

Transite. Asbestos-cement tubing used for telephone conduit. Buried directly in the earth.

Translator. Devices used in cross-bar systems which change information coded by one system to equivalent information coded by another system. It may convert a multi-frequency toll dialing code to a cross-bar marker code, a three-digit toll area code to a special local code, or an equipment number to a telephone number.

Transmission. Conveying electrical energy from point to point along a path.

Transmission, Beam. Radio transmission over a direct sight line in the same manner as light.

Transmission, Radio. Transmission of high frequency electrical energy through space.

Transmitter. (1) Device for converting sound waves to electrical waves; (2) electrical generating and sending device which originates radio waves.

Transmitter, Land. Fixed radio transmitter in a mobile, or ship-to-shore radio system.

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Reprints of the completed "Glossary of Telephone Terms" will be available following its publication in TELEPHONY (last installment to appear in July 31 issue), *provided sufficient orders are received to justify reprinting.* Companies desiring reprints for their employes are asked to inform TELEPHONY the quantity they will need as early as possible.

Transmitter, Mobile. Radio transmitter installed in an automobile.

Transmitter, Radio. Assembly of equipment which receives communication signals at low energy levels and voice frequency and generates them into space at high frequency and high energy.

Transmitter, Tape. Device for sending, at a rapid uniform rate, teletype code which has been punched on a tape with a perforator, or a reperforator.

Transmitting Equipment. That equipment, amplifier, filter, oscillator, etc., associated with outgoing signals.

Transposition. Interchanging the position of open wire conductors to reduce noise and cross-talk interference.

Transposition, Point. Method of making transpositions whereby the wires change positions within a few inches instead of requiring two spans.

Triangulate. Method of measuring one wire or circuit by taking three loops and solving by simultaneous equations.

Tributary Office. Smallest type of office handling toll calls. It may have toll circuits to the adjacent tributary offices, but passes toll calls to all other points through its toll center.

Trimming, Tree. Work of securing clearance for telephone plant by cutting back trees and brush to secure a free path.

Trouble. Failure of a circuit or circuit element to perform in a standard manner.

Trunk. (1) Both toll and exchange, a communication channel between two offices; (2) loosely, a circuit which can be switched to different terminals.

Trunk, CLR. Combined Line and Recording trunk. The trunk to the toll operator to which you are connected upon dialing a specific and designated number. Over it the toll operator "records" the details of the call and then "completes" the circuit to the called line.

Trunk, Interoffice. Trunk between any two central offices. Term usually limited to trunks within one exchange area as distinguished from toll switching trunks.

Trunk, PBX. Channels from a private branch exchange to a central office.

Trunk, Recording. Trunk used only for "recording" details of a toll call. Its transmission loss may be too high to permit "completing" the call.

Trunk, Switching (Toll). Trunk from a toll office to a local exchange office used for completing a toll call.

Trunk, Tandem. Trunk to or from a tandem office.

Tuned. Adjusted to resonate at a specified frequency.

Tuning. (1) Adjusting to a selected frequency; (2) adjusting for best operation at a selected frequency.

Twist. Twisted pair wire.

Twister, Sleeve. Tool, like a pair of pliers arranged to fit sleeves on line wire and for twisting the sleeves in making a joint. Used in pairs.

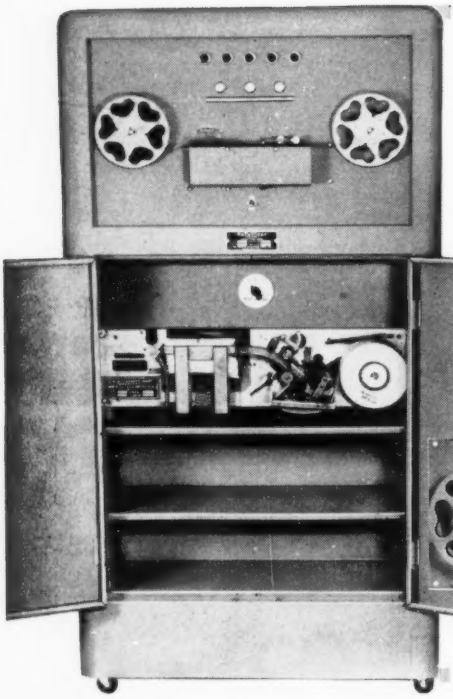
Two-Wire Repeater. Repeater which provides for transmission in both directions over a two-wire circuit, in carrier, usually operating on the principle of frequency separation for the two directions of transmission.

TWX. Teletypewriter exchange service.

Tying. Operation of fastening an open wire to an insulator with a short piece of soft wire ("Tie").

(Please turn to page 24)

NORTH



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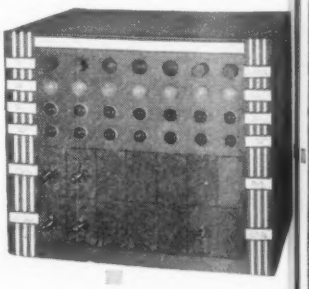

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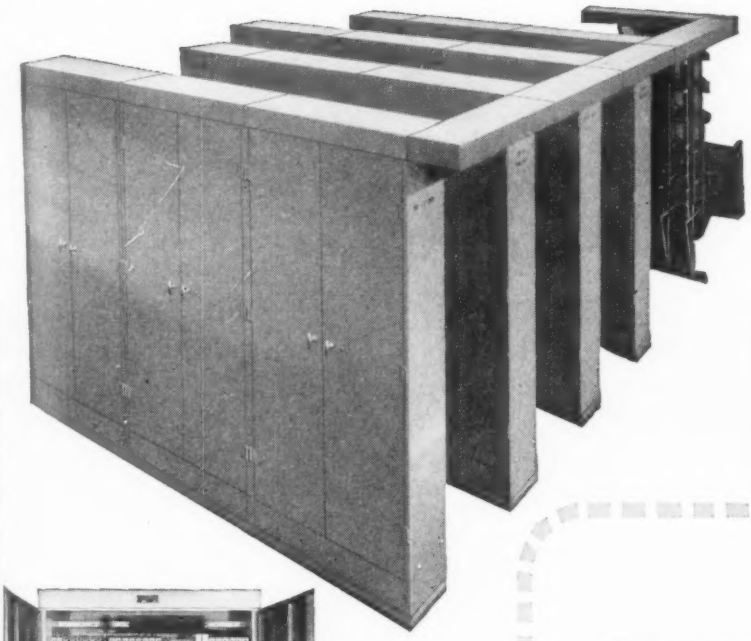

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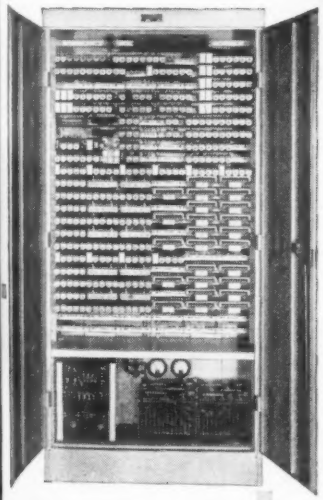

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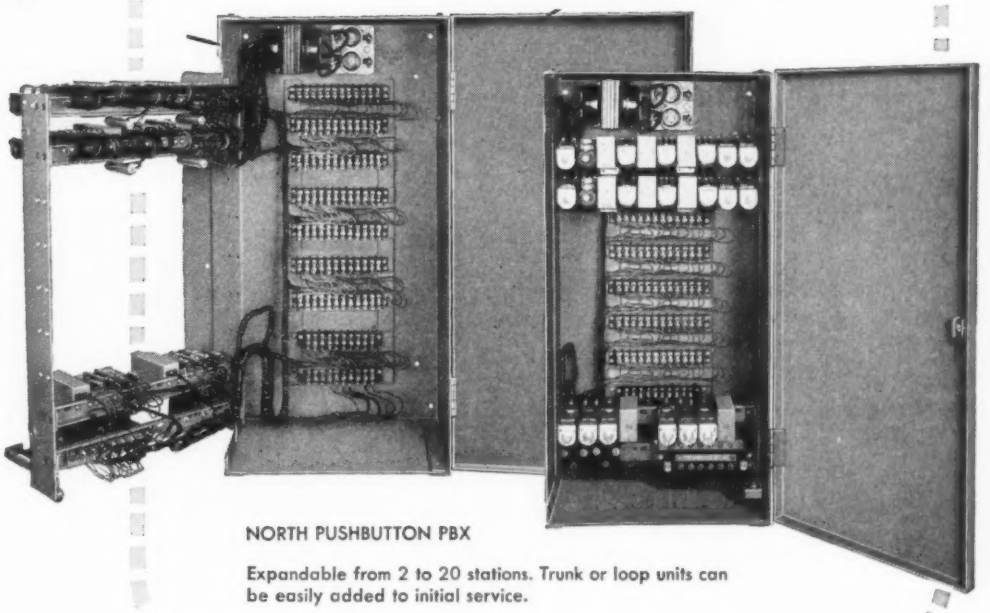

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U

Unit (of property). Single item of plant as defined for accounting entries.

Unit, Balancing. (1) Small condensers with adjustable capacity for use in central offices; (2) small coils of wire added at splices to adjust wire-to-wire capacity.

Unit, Circuit. In long circuit operation, a circuit section of some length but zero loss which can be added to other such sections to form a complete circuit. It can be patched interchangeably with other such units between the same points.

Unit, Cross-Talk. For current sent in a disturbing circuit each one-millionth received in the disturbed circuit is one unit of cross-talk.

Unit, Labor. Weighted figure applied to a standard work operation to measure the standard expectancy of the work of one man for one hour.

Unit, Message. One call within an exchange limit. Calls outside the exchange limit are measured and charged at two or three such units, etc., in computing a customer's bills.

Unit, Noise. Arbitrary amount of energy of mixed random frequencies which corresponds, in interfering effect, with a 1000-cycle tone 98.5 db below one milliwatt. Noise today is measured in db above (dba) a reference energy which is a 1000-cycle tone 90 db below one milliwatt.

Unit, Signal. Line signaling device associated with a switchboard drop or toll line circuit as distinguished from a "ringer."

Unit, Transmission. The decibel (db).

Unit, Trouble (Toll). Weighting figure applied to circuits or circuit elements to indicate their expected performance in a given period of time.

Unit, Volume (VU). Measure of the power level of the voice wave. Zero VU is equivalent to plus four dbm for simple electrical waves (single frequencies).

Upper Sideband. Higher of two frequencies or two groups of frequencies produced by a modulation process.

V

Valley. Dip or low spot in a drawn curve between two high spots or peaks.

Valve, Gas Admittance. In gas pressure systems, a valve selected and designated for connecting gas tanks for routine recharging of cables.

Varistor. Device whose resistance lowers when a high voltage is present. Used to shunt away harmful voltages. Also applied to copper oxide modulators or demodulators.

Varley. See **"Loop."**

Varley, Metallic, Three-Wire. Varley loop using a third wire for a return instead of ground.

Vault, Cable. Locked room in a building, usually in a basement, where outside cables are spliced to their tip cables.

Vector. Straight line drawn in a direction from a point and at an angle to a base. It represents a quantity directionally.

Vibrating. Moving or swinging to and fro. A mechanical oscillation.

V.I. Volume indicator; a VU (volume unit) meter.

Visual, Busy. Indicator which can be seen by the operator showing the circuit to be busy.

Vodas. Voice operated device for anti-singing. A device which disables the receiving path when the transmitting path is in operation, thus preventing "Singing."

Vogad. Voice operated gain adjusting device.

Volt. Unit of electromotive force or pressure. One volt drives one ampere through one ohm.

Voltage Amplifier. Voltage amplifier is an amplifier designed specifically to increase the voltage but usually capable of delivering little current.

Volume. Amount of energy in an electrical or acoustical train of waves.

Volume Indicator. Meter calibrated in volume units for measuring the energy of speech and music.

W

W. Watt.

Watt. Unit of electrical power. Equal to the product of the voltage and current, or the product of the resistance by the square of the current.

Wave. Successive amounts of electrical or sound energy caused by constant changes in the amount of instantaneous energy present. If regular and recurring the wave is "periodic"; if not recurring it is said to be "aperiodic" or "damped."

Wedge. Shaped piece of lead to hold cable sheaths in place when wiping and to prevent excess solder from running inside the sleeve.

Wiper. Moving part of a switch which rubs on and makes contact with a bank terminal.

Wire. Single cylindrical conductor having low resistance to current flow, with any associated insulation.

Wire, Bonding. Lead covered tie wire used to connect two cable sheaths until a splice is permanently closed.

Wire, Bridling. Wire with heavy insulation for connecting open wires together or to cable terminals.

Wire, Copper-Clad. Steel wire tightly coated with copper. Sometimes Copperweld.

Wire—Copper, Hard Drawn. Copper wire, processed to make it hard and strong, used for outside line purposes.

Wire, Drop. Paired insulated wire used to run from a pole to a subscriber's station.

Wire, Duplex. Parallel wires under one general insulation.

Wire, Flame-Proof. Wire with the insulation treated chemically to reduce the hazard of its catching on fire.

Wire, Fusible. Wire made of low melting point alloy used in fire alarm circuits.

Wire, Ground. Wire connected to earth.

Wire, Interior. Wire used inside buildings for connecting subscriber's equipment.

Wire, Jumper. Wire used for cross-connections on distributing frames and in terminals. Properly, "cross-connection wire."

Wire, Lashing. (1) Wire for spiral wrapping a cable to its suspension strand; (2) lead-coated bronze wire used for tying cable in position. Used instead of "marlin ties."

Wire, Line. Bare wire for suspension in the open on glass insulators.

Wire, Open. General term for bare line wires suspended on glass insulators.

Wire, Order. Properly, "order circuit." A circuit for dispatching information between operators or testers.

Wire, Shielded. Wire covered with insulation and this in turn by a grounded screen to reduce electrical interference.

Wire, Signal. Wire or leg associated with a circuit used only for passing signals.

Wire, Sleeve. (1) Third conductor when associated with a pair; (2) wire which connects to the sleeve of a plug or jack.

Wire, Steel. High strength wire used as a line conductor for long spans or gulch crossings.

Wire—Steel, Galvanized. Low cost line wire used for rural construction.

Wire, Third. Same sense as "sleeve" wire.

Wire, Tree. Heavily insulated and protected wire to resist abrasion from trees.

X

X. Letter used for the word "cross" as, "X-arm" for "cross-arm."

Z

Zone Registration. Method of tallying toll charges by message units. One, two, or more message units are charged for calls between particular zones. During the call a message register tallies the proper number of message units for each unit (three to five minutes) of time.

Zoning. System for selecting the type of subscribers instruments based on the electrical distance from the central office at which they will be used.

THE PLANT MAN'S Notebook

by Ray Blain, Technical Editor

WE HAVE received a letter from Ronald E. Guentzler, sophomore at Case Institute of Technology, Cleveland, O., in which he describes a home-made telephone system that has many novel and interesting features.

This started out as a bedside control of the lights and radio. Soon, however, a telephone was added and it finally developed into a private telephone system.

It is always a pleasure to hear from technical students who make telephony their hobby.

• • •

It has been said that a modern country is one which can ban fireworks and then produce H-bombs.

• • •

We have recently received some interesting reports on the use of a new liquid neoprene compound in the telephone industry.

This liquid has been used for the water-proofing of cable splices by applying it over fiber glass tape to prevent its slipping and to make it more moisture-proof. It has also been used to some extent for the coating of pole line hardware and other fixtures to prevent rust and corrosion. With bitter aloes added, it has been used for coating lead sheathed cables as a protection against squirrels gnawing the sheath. It has also been used as a coating for lead sheathed cable to close fatigue cracks.

While these uses have been experimental and definite results have not been proven at this time, there is every indication that this product will eventually find wide usage in the communications industry.

A friend of the writer who returned from Europe recently has given us a report of an interesting miniature German voice recorder called the "Minifon." This is a magnetic wire recorder that weighs about 2½ pounds and is no larger than a small camera. It uses a microphone that can be disguised as a wrist watch, worn as a tie pin, etc. It will record about 2½ hours and can be operated from either commercial power or batteries. One set of dry cell batteries has ample capacity to record for 2½ hours and then play back for the same length of time.

The recorder is presently being manufactured for use of law enforcement agencies in Germany, although it was developed originally for the use of Hitler's Gestapo.

• • •

Attorneys for Southwestern Bell Telephone Co. recently testified in support of an anti-slug law.

This law makes it an offense to manufacture or operate slugs in a telephone or vending machine in Missouri and Kansas. This company's slug intake dropped with enforcement of this law from about $3,000 per month to $500 in one city alone—Kansas City.

• • •

Now we learn that the Bell Laboratories are developing retractable cords to match the new "500" type sets in color. There appears to be no doubt that telephones in color are here to stay and cords to match the set will prove most attractive.

• • •

When a large PBX is located in an area where extended area and wider range dial service is available, serious problems may be encountered in the control of personal telephone service. Employes in general would much prefer to make their personal calls over their regular telephone, by the use of the dial, rather than to go out to the nearest public telephone.

We have personal knowledge of one large PBX installation where the monthly telephone bill increased over a thousand dollars a month when extended area and extra unit calls were opened to some 20 exchanges. Time and weather calls alone may amount to a considerable sum if this service is not restricted.

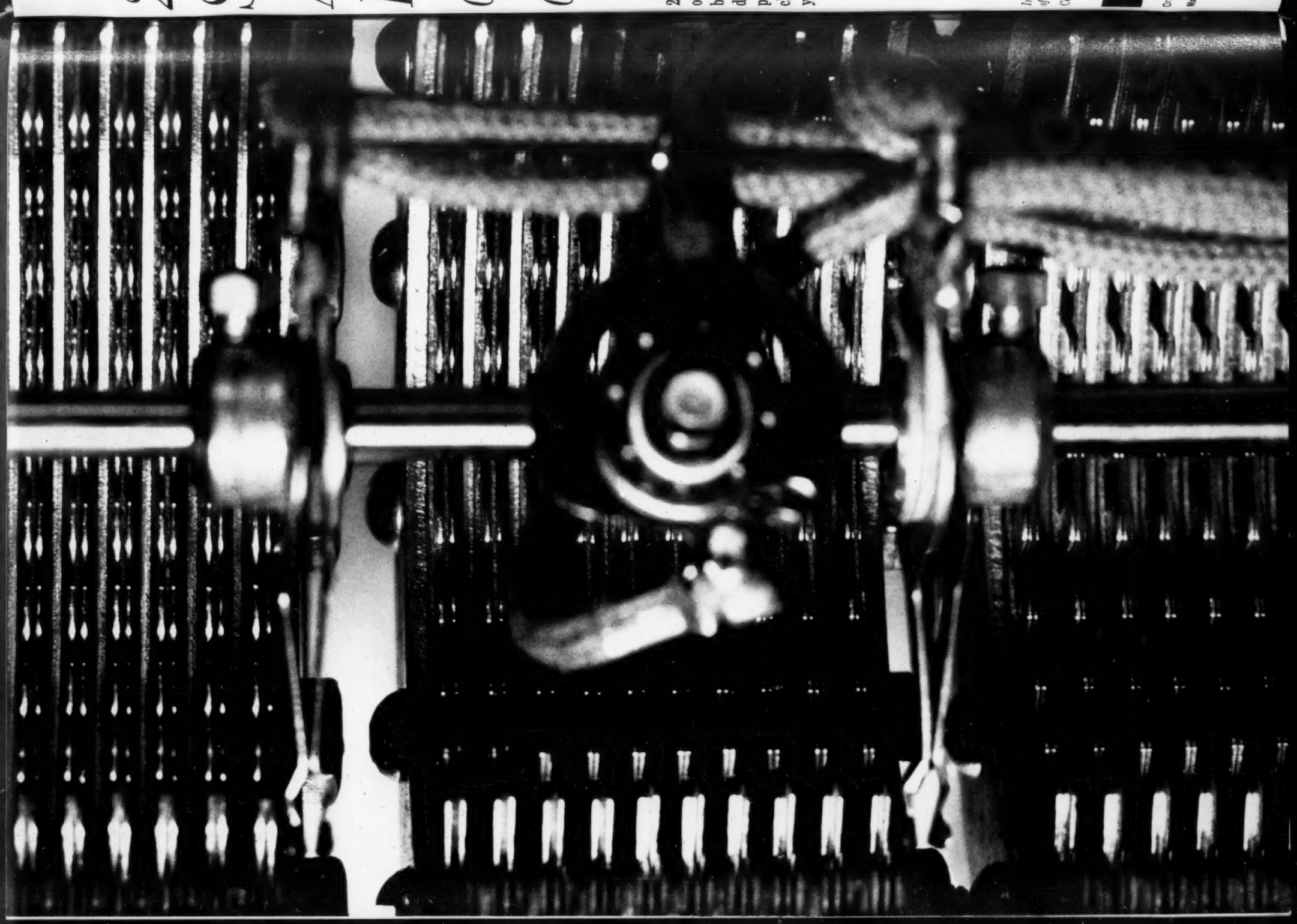
In the writer's opinion, the best, and in fact, the only satisfactory answer to this problem is some form of automatic ticketing. Of course, telephones may be restricted from the use of trunks but this in turn, will probably prove detrimental to good telephone service. In our opinion, restrictions should never be placed on any type of telephone service if they possibly can be avoided.

Automatic ticketing is not overly expensive and it is believed that in most cases it will prove a good investment for use on a large PBX switchboard. This equipment will provide an accurate record of the PBX extension that originates each call, the called number, the duration of the call, the time and date.

The cost of automatic ticketing can be reduced when considered desirable by arranging the equipment so that calls into one-unit zones will not be recorded. Then, calls dialed into extra unit zones will land on intercept and the customer will be advised as to the code to dial to gain access to the ticketing equipment and make the extra charge call. This intercept may be a recorded announcement when this arrangement is considered desirable.

This plan may be varied as required to meet local conditions and needs. There is every indication that automatic toll ticketing will be extensively used in the future on large PBX systems and main exchanges alike.

It is surprising how much of this country's telephone service is presently being handled over PBX systems. We are advised by one authority that in some of our larger cities, 15 per cent of the telephones, 25 per cent of the local service and 50 per cent of the toll business is handled over PBX systems.



200-point Strowger Automatic Linefinders offer 3 big advantages:

200-point linefinders mean lower operating costs, better service, better business! That makes good dollars-and-cents thinking—explains why more telephone men choose Strowger Automatic every year.

1 **fewer switches to maintain:** Standard traffic tables show that seventeen 200-point linefinders in one group handle over 7.4% more traffic than twenty 100-point linefinders in two groups of 10 each. Result: fewer switches to buy—fewer to maintain!

2 **easier balancing of traffic:** It is easier to distribute traffic in the 200-line groups of 200-point Strowger Automatic exchanges because average subscriber habits are more uniform than in smaller groups. Result: fewer line-assignment headaches!

3 **fewer busy-hour delays:** Greater uniformity of 200-point groups insures that business and residential subscribers with high and low calling rates will be more accurately proportioned between groups. Result: better service to users!

Investigate the advantages and economies of 200-point linefinders for your conversion.

Call us for a consultation today!

AUTOMATIC ELECTRIC

Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation . . . Machine Switching Automatic Dial Systems

Makers of Telephone, Signaling and Communication Apparatus • Electrical Engineers, Designers and Consultants

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month by month Strowger Automatic installations exceed all others

CALIFORNIA COMPANIES

Praised for Service Record

By GRANT SMITH, General Telephone Co. of California

C. F. MASON, chairman of the board of General Telephone Co. of California, retired after 20 consecutive years as president of the California Independent Telephone Association at its 1954 convention. Willard G. Wade, executive vice president of California Interstate Telephone Co. of Bishop, was elected president to succeed Mr. Mason.

The 35th annual convention of the California association was held June 10 and 11 in San Francisco's beautiful Fairmont Hotel high atop Knob Hill overlooking the bay and the city. About 600 telephone people attended, representing most of the 59 Independent telephone companies in the state.

Welcoming the delegates to the city, Paul Beck, chief of the valuation and rate department of the City and County of San Francisco, said:

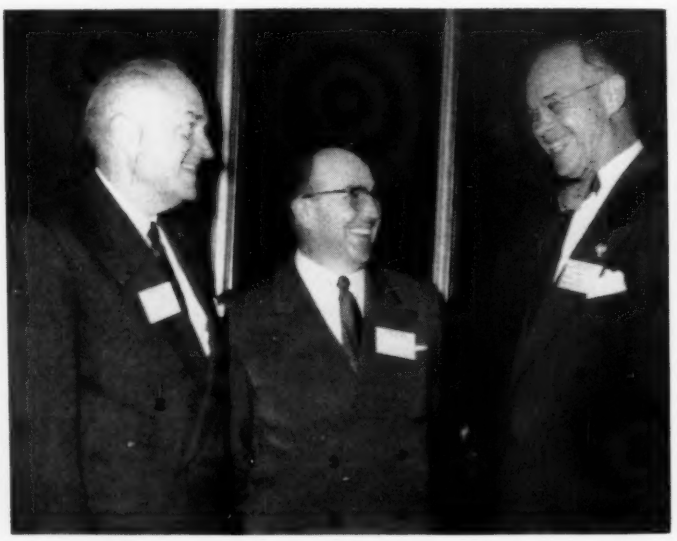
"In these United States the fact that Independent telephone companies still exist, and that the large Bell System cooperates with the Independent companies to give a nation-wide telephone service, is a shining example of the good-will that exists in the telephone industry toward the full realization of our cherished way of life."

Launching into a discussion of telephone rates, Mr. Beck expressed the opinion that "the free enterprise system which has made this nation great is based upon the principle that services and goods cannot be sold for a price higher than the value which the purchaser places upon them. The principle of pricing local telephone rates on the relative value of service is, therefore, not something unique to the telephone business.

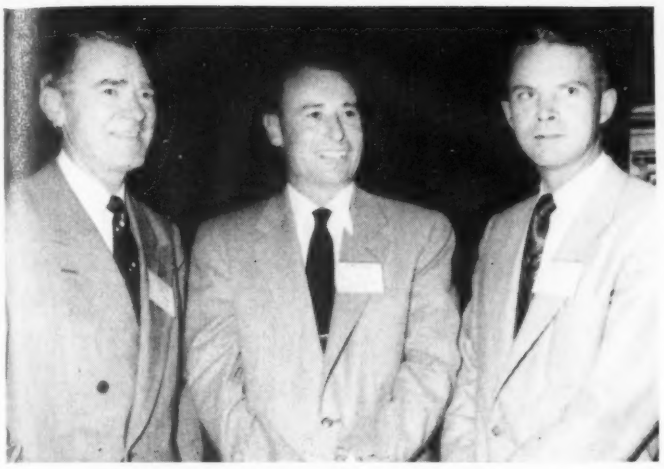
"Telephone rates," he said, "should be spread on the basis of 'equal rates for equal service'." The relative value of service in local calling areas is susceptible to measurement, this measurement being station availability, he observed.

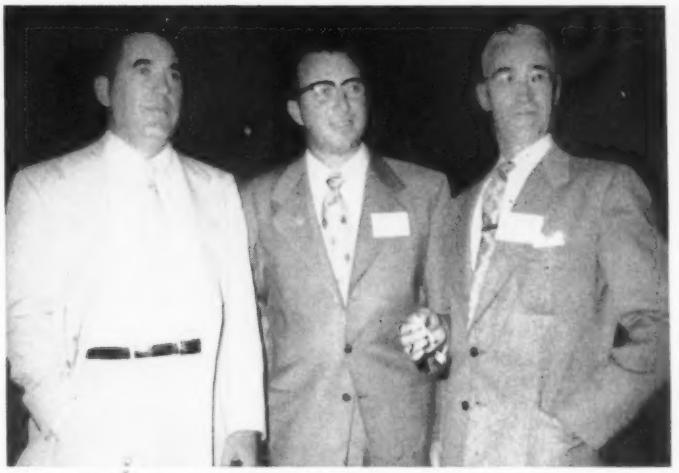
In the absence of C. F. Mason, president of the association, his address to the convention, entitled "Twenty Years With California Independent Telephony," was read for him by Edwin M. Blakeslee, president of General Telephone Co. of California. Mr. Mason's address reviewed the growth of the Independents during the past year, and touched on problems facing the industry in the future.

"It has been another year of steady expansion, both in plant and in number of customers, in a fast-growing service area where record expansion has become almost an old story," he said. "On the other hand, it has been a year of exceptional rate case activity because of the worrisome lag in our company revenues behind the continued rise in operating cost. Offsetting this was the welcomed reduction in excise taxes on both monthly bills and toll calls to a flat ceiling of 10 per cent—saving our customers millions of dollars which otherwise would have had to be collected under the old 15 and 25 per cent taxes, respectively. He continued:



LEFT PHOTO: EDWIN M. BLAKESLEE (left), president of General Telephone Co. of California, WARREN CLAY (center), president of USITA, and RAY BARNES of General Cable, get together at San Francisco. RIGHT PHOTO (left to right): HARRY A. BARROWS, MRS. BARROWS, MRS. E. R. FISHER, and MR. FISHER, all of California Water & Telephone Co.





LEFT PHOTO: "Snapped" at the California convention were, left to right: R. C. FERBER, C. H. HARLING, and ART TAYLOR, all of California Interstate Telephone Co. RIGHT PHOTO: Left to right: W. J. URGA, HERSHEL TRUMBO, both of Henderson Telephone Co., and A. A. CULWELL of Pacific Telephone & Telegraph Co.

"Rate cases are difficult enough in themselves to prepare and justify. But there have been occasions when difficulties for both utilities and our California regulatory commission have been augmented by what appears to be politically inspired opposition. I commend to your attention the comment made . . . last October by California Public Utilities Commissioner Peter E. Mitchell, addressing the League of California Cities. He suggested that utility companies be given a chance to make a showing before anybody jumps to the conclusion as to whether or not a given rate increase application has merit.

"Too often have we seen politically articulate figures rush into print or public statement opposing or ridiculing proposed rate increases as soon as they are filed—before they could possibly have any accurate knowledge of the justice or merits of the proposed rate changes.

"Summing up on this question of rates, I can foresee no likelihood that they will diminish in number or dollar amounts requested in the period ahead. For our Independent member companies, the significance of this cloudy outlook is plain enough. They must be prepared to seek and justify rate changes which will produce whatever revenue is necessary to maintain service standards and to improve them wherever feasible. . . .

"Although we can expect some leveling off in the demand in some areas in the months ahead—because of the reduced volume of business activities here and there—the over-all pattern of dynamic growth, which has characterized our industry in every year since the end of the war will continue to manifest itself in the year to come, I am sure."

Preston Hotchkis, widely known for

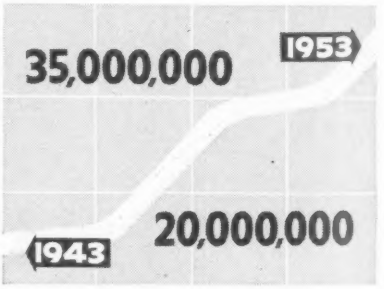
(Please turn to page 38)

Attending the meeting of the directors of the California association were, left to right: F. V. RHODES, DONALD H. STRAHL, J. P. MACGUIRE, WILLARD G. WADE, RICHARD D. CROWE, J. CURTIS NEWMAN, and FRED H. MacGOUGAN.

LEFT PHOTO: Attending the California Convention were, left to right: MRS. HAZEL DOWNEY, ALLAN STACEY, and T. W. BERNHARD (extreme right), all of Sundland-Tujunga Telephone Co., with W. G. CHAFFEE (second from right) of Pacific Telephone & Telegraph Co. RIGHT PHOTO: These delegates from General Telephone Co. of California are, left to right: HOMER WACHTEL, PAUL STAPLES, HERB FRAHM, EUGENE APTED, and MEL STIRES. (All photos were taken by BEN HARVEY, editor of *The Circle*, employe magazine of General Telephone Co. of California.)

What telephone companies serve two-thirds of the entire area of the U.S.?

ANSWER: *The Independent group of 5,100 telephone companies.*



AVERAGE LOCAL CALLS PER DAY
for Independent Telephone Companies

Yes, it's a fact! The nine million telephones of America's Independents speak for *two-thirds* of the nation!

In large cities and small communities, their growing lines link homes, offices, factories and farmhouses. Their friendly, dependable service provides security and comfort in time of need. Their long distance lines, interconnected with those of the Bell System and with each other, extend nationwide telephone service to all parts of our country—however remote.

Independent Telephone Companies comprise a 1½ billion dollar industry that has doubled in size in the last 10 years. They are still gaining—in service, in strength, in importance. And as the Independents gain, your own telephone service gains in value and usefulness.

USITA

* *Telephone instrument in photograph above manufactured by Kellogg Switchboard and Supply Company, Chicago, Ill.*

United States Independent Telephone Association

Munsey Building : Washington, D. C.

On the page at the left is the fourth advertisement of the national campaign of the United States Independent Telephone Association to publicize the Independent telephone industry. The ad will appear in the Aug. 9 issue of *Time*, and the Aug. 27 issue of *U. S. News & World Report*. A similar ad will appear in the Aug. 9 issue of *Country Gentleman*.

B. C. Telephone Co. Buys Small Vancouver Company

Approval has been granted for the sale of Chilliwack Telephones, Ltd., Vancouver, to the British Columbia Telephone Co., Vancouver.

A special order-in-council by the federal cabinet gave official sanction to an order from the Board of Transport Commissioners, authorizing the sale. Previously, special meetings of the shareholders of the two companies had approved the transaction. Effective date for the sale is Aug. 1.

The main reason given for the sale was that considerable expansion and improvement of the facilities in Chilliwack and Yarrow are necessary, and the smaller company would have had difficulty in financing the new work. More than half a million dollars will be spent by the British Columbia Telephone Co. to expand and improve the service.

On Aug. 1, the rates applicable to other British Columbia Telephone Co. exchanges of a similar size will apply to the Chilliwack company subscribers. In some cases the new rates will be higher and in some cases lower than those already paid by Chilliwack residents. Chilliwack, including Yarrow, with a total of 4,280 telephones is in Group Five, which encompasses exchanges having 2,501 to 5,000 telephones.

Other exchanges in the same group as Chilliwack include Kamloops, Nelson, Cloverdale, Trail and Port Alberni, as well as Richmond.

E. E. Sinden, present manager of Chilliwack Telephones Ltd., will now take over the duties of district plant chief. The scope of his operations will be increased to include supervision of plant matters for Abbotsford, Mission, Hope and Agassiz, as well as Chilliwack and Yarrow. He will report to the district plant manager at New Westminster.

Other personnel in Chilliwack Telephones, Ltd., will become employes with the British Columbia Telephone Co., with no change of duties.

V V

New York Company Enlarges Direct Dialing Area

Faster telephone service to many New Jersey points for users of 630,000 telephones in midtown Manhattan will begin at 12:01 a.m. on July 25, a New York Telephone Co. spokesman announced on July 23.

"The new service," he said, "will enable customers in certain midtown exchanges to dial their own station-to-station calls direct to 1,300,000 of the telephones in northern New Jersey. The calls will go through swiftly and the billing record for them will be made automatically by 'electronic brain' equipment.

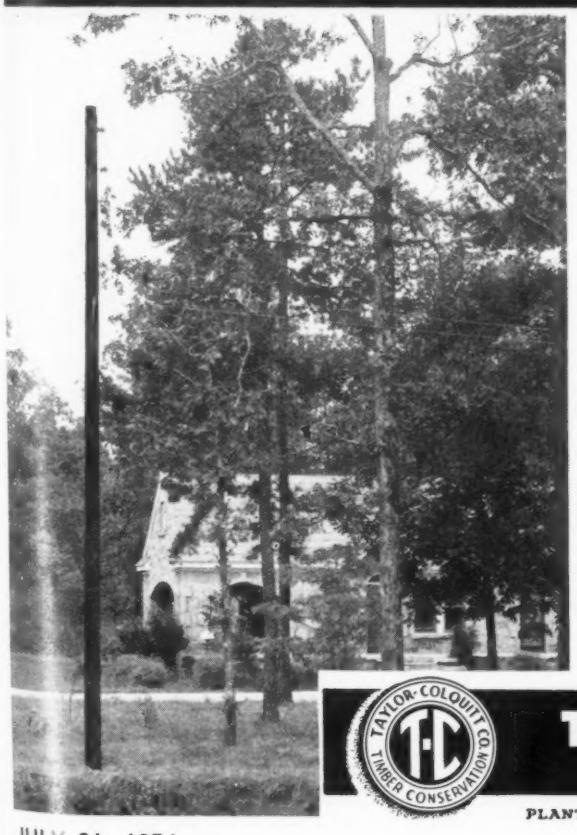
"This is the second recent major expansion in the dialing area for Manhattan subscribers. The first was in 1950 when southern Westchester and Nassau County were added to their dialing range."

V V

Ark. Co-op Buys Independent

It was announced on July 20 that the Central Arkansas Telephone Cooperative, Inc., has purchased the Donaldson Telephone Co.

FOR FIRST CLASS SUBURBAN AND RURAL LINES



TAYLOR - COLQUITT
TREATED PINE POLES

With the trend moving rapidly toward more suburban and rural line construction, Taylor-Colquitt treated pine poles ideally meet one of the pressing problems which telephone companies face.

For service can be no better than the lines and good lines can only be built on first class poles. Not only must these poles be strong originally but they must be able to retain their strength and stand through the years, unattended and undisturbed.

The many million which Taylor-Colquitt has furnished during the past quarter century give eloquent testimony to the service that Taylor-Colquitt treated pine poles give.

Taylor-Colquitt poles are distributed to independent telephone companies exclusively by Automatic Electric Sales Corporation, 1033 West Van Buren Street, Chicago 7, Illinois.

TAYLOR-COLQUITT CO. TIMBER CONSERVATION T-C

TAYLOR - COLQUITT CO.
SPARTANBURG, SOUTH CAROLINA

PLANTS AT SPARTANBURG, SOUTH CAROLINA AND WILMINGTON, NORTH CAROLINA

COURTS AND COMMISSIONS

Michigan Bell Wins Rehearing On General Rate Raise

The Michigan Public Service Commission on July 19 granted the Michigan Bell Telephone Co. petition for a rehearing on its application for a 22-million-dollar general rate increase (TELEPHONY, July 24, p. 34).

The commission adjourned the hearings after granting the petition to reopen consideration of the application. Robert Derengonski, assistant state attorney general assigned to the commission, said the adjournment was taken to give his staff time to prepare cross examination. He added it might be as long as a month before the hearings are resumed.

Company officials said an increase in investments and higher operating costs spurred the request for a rehearing. Errors in conclusions reached by the commission in May also were charged by the company.

V V

North Carolina Company Seeks Approval of Interim Rate Raise

The Mebane Home Telephone Co. asked the North Carolina Utilities Commission on July 19 to approve an interim rate increase which it said is needed pending completion of an expansion program.

Last March, the commission approved new rates for the company to become effective after it completed a proposed expansion program. In the new petition, the company said its expansion program cannot be completed until September, 1955, much later than originally expected, and that a rate increase is needed at once to provide additional funds needed for the expansion.

It proposed that residence rates be increased from $2.75 to $4.50, and business rates from $4.00 to $6.75. Present rates range from $2.00 to $3.50 and from $3.00 to $4.50.

V V

Two Wisconsin Companies Seek Discontinuance O.K.

Two Wisconsin companies, the Rock River Telephone Co., Waupun, and the Upper and Lower Trout Creek Telephone Co., Brigham, recently filed petitions with the Wisconsin Public Service Commission asking authority to discontinue their service and abandon their lines.

The Upper and Lower Trout Creek company receives switching service from the Barneveld exchange of the General Telephone Co. of Wisconsin, which has offered to provide service to the subscribers of the Trout Creek company. The commission will conduct an investigation without holding a hearing and will announce its decision later.

In the case of the Rock River company petition, fourteen stockholders and subscribers of the company signed the petition asking discontinuance authority.

The company owns a line three miles long, for which switching service is provided by the Wisconsin Telephone Co.

The need for extensive line and pole replacements, with the possibility that the Waupun exchange of the Wisconsin Telephone Co. might be converted to dial within a few years, led to the decision to abandon the line.

The Wisconsin Telephone Co. has agreed to provide service at once for the company subscribers if the request is granted. New poles and lines will be installed as soon as possible, and the present magneto telephones will be replaced with modern desk type receiver sets.

The commission will investigate the Rock River company petition without hearing.

V V

Missouri Company Gets Rates Applicable for Dial Service

Citizens Telephone Co., Higginsville, has been granted authority by the Missouri Public Service Commission to increase its rates by $37,000 a year but not all of the increase will be effective immediately (TELEPHONY, May 15, p. 32).

The higher rates will go into effect at once for subscribers in Mayview and Corder, where conversion to dial service has been completed. But the old rates will continue in Higginsville until telephones there are converted to dial service around Sept. 1.

V V

Rate Increase Authorized for Virginia Independent

The Virginia Corporation Commission on July 21 granted a general rate increase to the Piedmont Telephone Co., Haymarket.

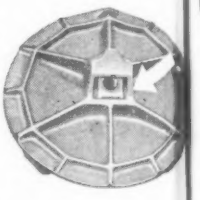
The order, effective Aug. 1, will permit the company to raise its charges for residence multi-party service from

Construction
and
WITH THE DOUBL
STROMBERG-CARLSO
LEADIN

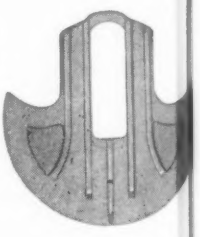
everstick anchors

. . . are designed to meet the most rig
anchoring and guying specification

The patented EVERSTICK Nut Housing locks anchor firmly on rod, making installation simple under all conditions and permitting easy recovery of the rod. Note well-designed, heavily constructed sections of metal in base plate.



EVERSTICK Expanding Plates are *ribbed* to double their original strength; their cutting edge and wedge shape arm socket reduces earth resistance to a minimum and assures easy expansion.



Three-Way EVERSTICK with expanding plates—contacts solid earth at every point around base plate, giving full benefit of earth's holding power.

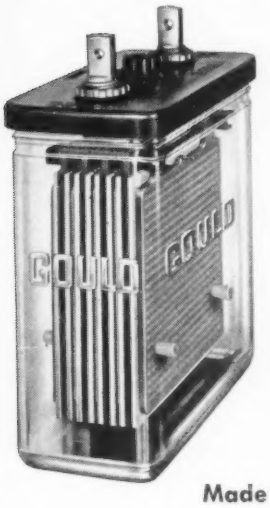
Spreader Arms extra heavy ribbed with ball and socket joint at top and clinched socket on expanding plates allow heavy bearings to move freely with minimum friction, insuring easy expansion which eliminates buckling or breaking of arms.

EVERSTICK Anchor

...the anchor of merit

...materials
...Supplies
...UARANTEE OF
...UBL
...LSO ...ND AMERICA'S
...DIN ...ANUFACTURERS

the battery that lasts practically forever



gould planté

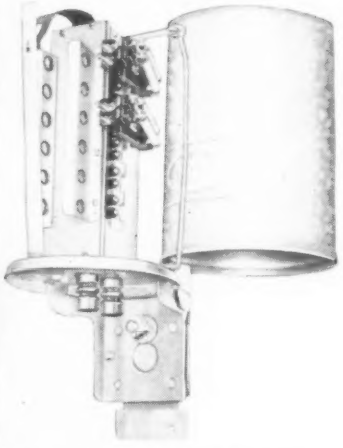
For long life and uniform dependable service, no other telephone battery equals the Gould Planté. It has rolled up amazing performance records, remaining in active full-float service for 20 years, 30 years and longer!

In the Planté, *all* of each positive plate is pure lead, containing *no* antimonial impurities. Thus, Gould has eliminated the primary cause of self-discharge, capacity losses and shortened battery life. Planté batteries float at constant voltage and maintain rated capacity all their life. Because they almost never need service, maintenance is negligible. If you would cut battery costs to a minimum, choose Planté.

Made by GOULD-NATIONAL BATTERIES, INC.

versatile new

S-20 V cable terminal



...kes any size compression coupling from 6 pair to 51 pair...

...Made with two cable entrances for use with ...lastic cable, the new Cook S-20 V Cable ...erminals simplify cable installation.

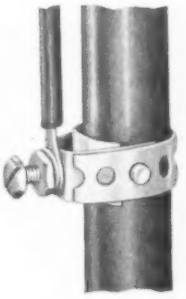
...hey can be ordered in advance without ...compression couplings—and the couplings ...nd pipe plug ordered later to conform to ...he specific cable layout. *Or,* if plastic ...able additions are ever needed, the com...pression couplings can be easily adjusted ...*in place* to conform to the revised cable ...ayout without removing the S-20 V Cable ...erminals from the poles.

...he S-20 V can be used separately or as ...art of the Cook Trans-Mount System of ...rotection and Distribution. All hot gal...anized steel construction, the complete ...erminal is designed for maximum service ...nder all conditions.

Mfd. by Cook Electric Co.

reliable station ground clamps

• • • for all telephone, radio and signal circuit station grounds. Design principles of this clamp are field-proved to maintain high pressure contact and maximum conductivity to joint.



Station Ground Clamps are adjustable for grounding to water pipe

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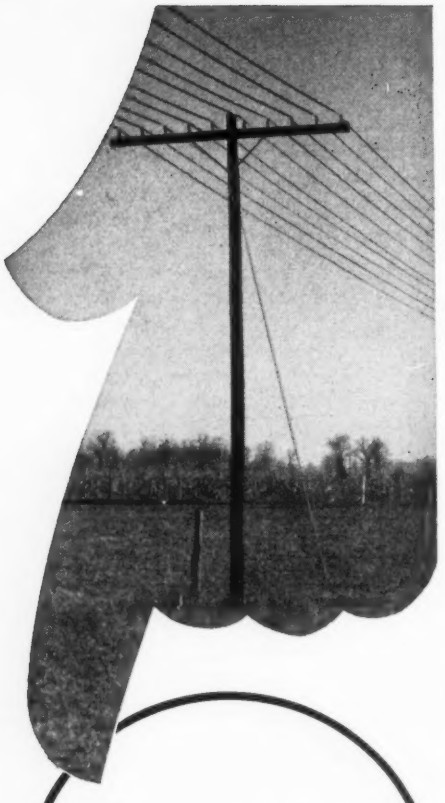

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INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA U.S.A.

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Cost Per Mile

● Efficient rural telephone circuits can be built at minimum overall cost where Crapo HTL-135 High-Tensile Line Wire is used to full advantage. For Crapo HTL-135 makes possible spans up to 350 feet in heavy, 540 feet in medium and 650 feet in light loading districts. Longer spans mean fewer pole structures with substantial savings in material and labor costs per mile.

The rugged tensile strength of Crapo HTL-135 and its heavy galvanized coating provide dependable and economical service life on typical rural lines.

Ask your jobber for details or write direct for engineering data!

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$4.00 to $4.75 and from $5.00 to $6.00 for multi-party business. It also allowed the company to raise charges for one-party residence service from $5.00 to $7.75 and for one-party business $7.00 to $10.

Company records showed that multi-party service makes up the bulk of its business.

V V

Turn Down Rate Application of Missouri Independent

The Missouri Public Service Commission on July 20 refused to let the Warrenton Telephone Co. increase rates $9,228 a year.

The commission said proposed wage increases which the company claimed would increase its expenses were "too speculative" to justify the increase. Commission accountants figured the proposed boost would amount to 40.8 per cent of the company's current local revenue.

The company serves 982 subscribers.

V V

Grant Increase in Illinois

The Illinois Commerce Commission recently authorized the Harrisonville Telephone Co. to increase rates $47,000 annually for service in Columbia, Dupo, Fults, Prairie du Rocher, Red Bud, Waterloo and Valmeyer (TELEPHONY, Mar. 27, p. 31).

Central Company Registers $1,500,000 Bond Issue

Central Telephone Co. registered a 1.5-million-dollar block of convertible debentures with the Securities Exchange Commission, it was reported on July 22.

The subordinated debentures, due May 1, 1969, will be offered publicly through underwriters headed by Paine, Webber, Jackson & Curtis and Loewi & Co.

V V

Seek Sale O.K. in Missouri

The Missouri Public Service Commission was to have held a July 30 hearing on the application of Glen A. Atkins and his wife Ruby E. Atkins, doing business as the Rogersville Telephone Co., for authority to sell their telephone plant and properties to the Southwestern Bell Telephone Co., and to withdraw from business.

V V

Rate Raise O.K.'d in Kentucky

The Kentucky Public Service Commission recently approved the application of the R. L. Jernigan Telephone Co., serving 62 subscribers in northeast Shelby County, to increase rates $200 annually.

V V

"They that govern most make least noise."—JOHN SELDEN.

An exchange which has grown from 2,177 stations to 5,000 stations in 3½ years will be converted to dial next year by the General Telephone Co. of California. Lancaster is the exchange and this little desert community has experienced a phenomenal population and industrial growth. In 1932, when the General company acquired the exchange, there were 250 telephones in service; in 1945 there were 650; in January of 1948, 938 and in January of 1950, 2,177. MRS. LORRAINE ROBBINS, who received the 5,000th telephone, turns the first spadeful of earth for the company's new Lancaster central office building. Participating in the groundbreaking ceremony (shown above, left to right) are CARL VON HAKE, EDWIN M. BLAKESLEE and R. D. COLLINS, chief engineer, president and western division manager, respectively, of General of California; WALTER K. ROBBINS, husband of Mrs. Robbins; FRANK ASHLEIGH, the company's commercial manager; and BYRON GLENN, secretary of the Lancaster Chamber of Commerce.

BOOK REVIEW

"THE DICTIONARY OF BUSINESS AND INDUSTRY" by Robert J. Schwartz. Price, $7.95; with thumb index, $8.95.

Business and industry, which has grown multifold in size and complexity in the past few years, will soon have its own dictionary. The above-mentioned book, edited by Robert J. Schwartz, a practicing attorney, defines 45,000 business and legal terms.

The idea for the dictionary came out of the editor's search for a business dictionary to fit the needs of a client who wished to distribute it to 400 branch offices to standardize business terminology. Important sources were approached, such as the New York Public Library and the U. S. Department of Commerce. A careful search revealed that there was no one comprehensive source of definitions of business and industry.

To supply this important business tool, Robert J. Schwartz set out to assemble, classify and edit a dictionary of business and legal terms. More than 1,000 leading trade associations were contacted for lists of business terms. Leading businessmen in key industries were consulted. Specialized glossaries were procured for the herculean task of assembling the most commonly used business, trade and legal terms.

Each term was carefully defined and was earmarked for the dictionary if it qualified as to business usage. A total of 45,000 business terms are included in the finished volume—most of which cannot be found in the average home, office or collegiate dictionary. For example: such trade names as dacron and orlon; such trade terms as bird nesting, fish eyes, kitten's ear, Q-factor, layboy. Thousands of commonly used trade abbreviations such as C.W.O., MUF., VI, F.i.b., Gbo., P.D. and legal terms such as habendum are explained and defined.

In addition, the dictionary contains 36 pages of valuable time-saving charts and tables such as Coins and Notes of the World; Foreign Weights and Measures; Weights of Materials; Foreign Trade Definitions; Conversion Factors; Square Cubes, Square Roots and Cube Roots, and Units of Measurements.

"The Dictionary of Business and Industry" can be used to standardize business terminology throughout business organizations; to help the average businessman understand legal terms commonly used in contracts; to help secretaries work more efficiently; to help salesmen talk the customer's language; to help billing, shipping, purchasing departments avoid making possibly costly mistakes through the misunderstanding of commonly used business terms.

This book may be purchased through Telephony.

"Why, yes—you do have an honest face. I'm sure we can wait until next month for your telephone payment."

"Tops" IN THE MONEY-SAVING BRACKET

CODE No
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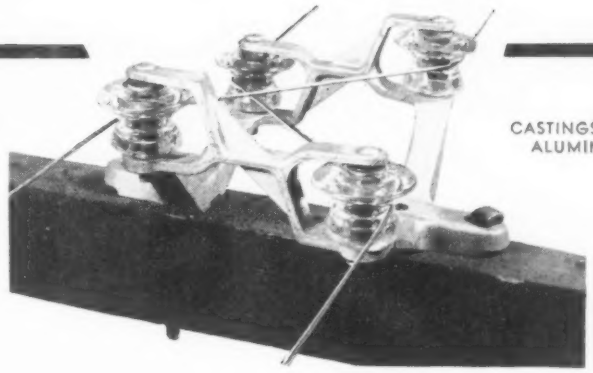

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Insulators come equipped with rubber bushings which maintain line circuit operation in event of breakage.

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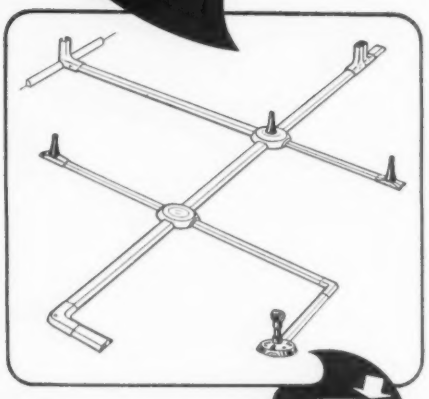

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Two interconnecting sizes give you complete flexibility to answer every requirement of original wiring, or extensions of present circuits.

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PLUGMOLD – multi-outlet systems
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CARRIER SYSTEMS

Continued from page 19

the circuit, it can, by its ability to amplify, supply additional pulses of current to keep the ac circulating in the resonant circuit, or to keep the "flywheel" turning, so to speak.

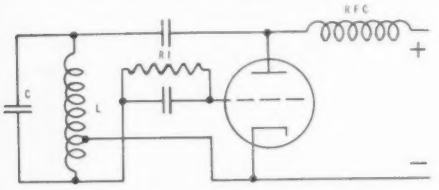


Fig. 12 - Basic oscillator circuit. Frequency is determined by values of L and C. Grid bias is provided by R1. Choke RFC keeps a. c. from backing into battery.

The way this is done is illustrated in *Fig. 12*, which is a basic Hartley oscillator circuit. Oscillators require that some of the output of the circuit be fed back into the input, so that it will be self sustaining. Every telephone man is familiar with the howl that results when the transmitter and receiver of a telephone are placed together, which is a case of coupling the output back into the input. When the gain of a repeater is set too high, or not matched to the line, the same thing results—part of the output returns to the input and oscillations result.

Feedback

In the oscillator shown, note that the plate output is fed back into the grid input through the coil, which for this purpose may be regarded as an autotransformer. In any coil the polarity at one end is always opposite to the other, therefore, the polarity on the grid at any moment is in opposite phase to that on the plate end of the coil. This condition, which is also known as positive feedback, is necessary for oscillations to occur.

There are many different designs for oscillators, but most have the same basic requirements. If the feedback is in the same phase relationship between grid and plate, negative feedback results. Under these conditions, the circuit will not oscillate, because the plate output would be subtracting from the grid input instead of assisting it. The tube might be thought of as throttling itself.

This principle of negative feedback is actually used in amplifiers and carrier systems to regulate or hold down the amount of amplification. It is also used to improve fidelity of an amplifying system by cancelling out distortion that may occur in some parts of the circuit.

In the Hartley oscillator shown appears a method of obtaining grid bias voltage which we have not mentioned previously. It is called grid leak bias. Looking at the point where the cathode connects to the coil, it will be seen that as ac appears in the coil, there will be times when the grid is positive with respect to the cathode. If the grid becomes positive, it acts like the plate, and draws electrons from the cathode. This current will flow through the high resistance in the grid circuit causing a voltage drop across the resistance. Because the source of positive polarity is the end connected to the coil, this end of the resistance is positive, and the grid end becomes negative, which is what the grid needs for bias. The condenser in parallel with this resistance is for the purpose of passing the ac which is to be fed in for amplification.

Because the circulating ac in the resonant or "tank" circuit gets a boost on every cycle as it goes through the tube, it will continue, the resistance losses will be overcome, and the circuit will continue to supply ac at the frequency required.

Carrier Application

The Hartley oscillator as shown appears to be a simple device and can be easily constructed. However, like many other oscillators there are things which can interfere with its operation.

First of all, changes in plate voltage can affect the frequency. Next, if any attempt is made to couple to this circuit in order to use the generated oscillations elsewhere, operation will be affected. This is because if any other circuit is connected by means of either a transformer or condenser, this additional load will become part of the circuit. It can change the frequency, or can load the oscillator down so that it will stop generating. In addition temperature changes can affect it, because of changes in the electrical constants with expansion and contraction.

Yet, for all of this, this oscillator is used with success in many carrier systems, particularly the low frequency, three-channel systems. It provides satisfactory results and does not deviate in performance because of the careful manufacture and great precision of its parts. This requirement of precision manufacture applies as well to other components of a carrier system. This is the main reason why a five-tube radio can be bought for $20, while a five-tube carrier may cost $1,000.

The reader should retain from the foregoing the idea that a resonant circuit made up of a coil and condenser,

can be made to provide alternating current of any frequency, if a vacuum tube is connected in a manner which will replenish the power loss in the resistance of the circuit. The frequency of the ac generated will depend on the size of both coil and condenser.

We have reviewed the operation of vacuum tubes, coils, resistances and condensers and found that they are simple devices. We have seen that a vacuum tube can be made to amplify a signal, or to oscillate and become a generator of alternating current.

These parts can be put together to form a telephone carrier system. In the carrier system, these various parts will behave just as they did in our simple drawings and experiments. Of course, there will be many wires and parts in the carrier, and many additional components to insure stability and reliability, but each portion of the circuit will be found to be as simple as our little diagrams here. When analyzing carrier equipment, if it is known what each part is supposed to do, tracing the circuit becomes the old story of "battery to ground" and trouble shooting becomes easier.

Subsequent articles in this series will show actual carrier circuits as used in three-channel operation. The simple circuits already shown will be compared to the actual equipment. Because different manufacturers use different methods of achieving results, representative drawings of different systems will be shown.

"Our Customers"

Our Customers are the most important persons in this business—whether we deal with them in person, by mail, or by telephone.

Our Customers are not dependent on us—we are dependent on them.

Our Customers are not an interruption of our work—they are the purpose of it. We are not doing them a favor by serving them—they are doing us a favor by giving us the opportunity to do so.

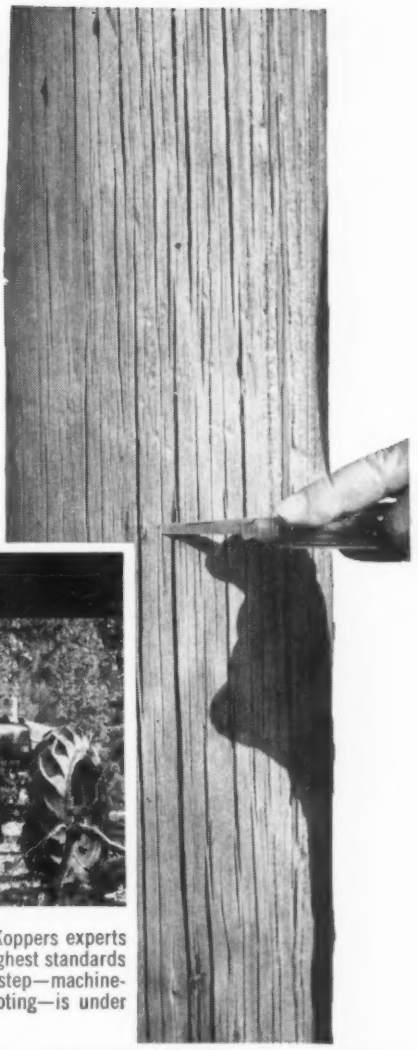
Our Customers are not outsiders to our business—they are part of it.

Our Customers are not cold statistics — they are flesh-and-blood humans with feelings and emotions like our own, and with biases and prejudices.

Our Customers are persons who bring us their wants. It is our job to handle them profitably—profitably to both the customers and ourselves.

—Author unknown, Telephone Topics

What makes a 40-Year Pole?

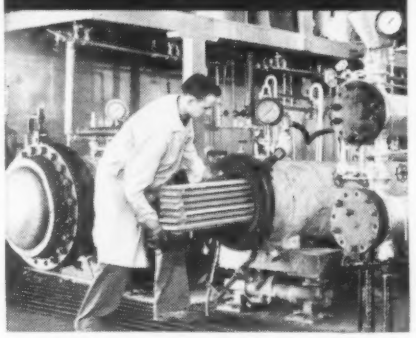


When it's a Koppers Pressure-Creosoted Pole, like the old-timer shown here, there's a *combination* of reasons which can be summed up by the phrase — "Koppers Quality Control."

QUALITY CONTROL

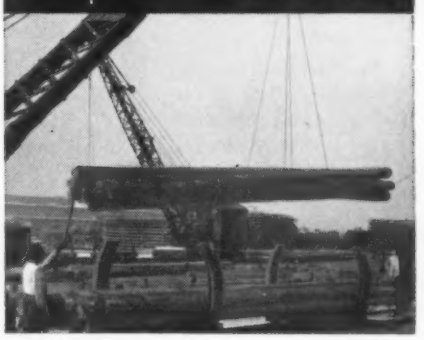
Koppers quality control starts right with the timber. Koppers experts approve a purchase only when the timber meets the highest standards of strength and straightness. Then, every other step—machine-peeling, stacking, seasoning, framing, pressure-creosoting—is under the strict supervision of skilled personnel.

LABORATORY RESEARCH



Quality control doesn't end with the sale or shipment of Koppers Poles. Koppers "quarrels with success" by carrying on a continuing program of research to make wood do an even better and more economical job for you. In one of the most complete wood-treating laboratories in the world, Koppers technicians conduct exhaustive tests on the prevention of wood deterioration.

DEPENDABLE DELIVERIES



In addition to supplying good poles, Koppers makes shipments on schedule. Koppers has many strategically located pressure-treating plants that have ample stocks to satisfy your requirements. Write for prices and further information on Koppers Pressure-Creosoted Poles.

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KOPPERS **PRESSURE-CREOSOTED POLES**

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which type jacket do you prefer ?

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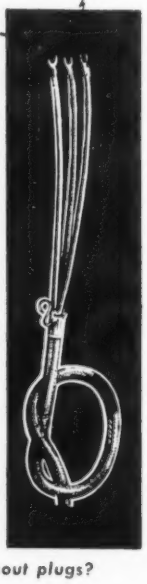

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CALIFORNIA CONVENTION

Continued from page 29

his civic and public activities throughout California and recently appointed United States Representative to the Economic and Social Council of the United Nations, spoke on "Current Sessions of the United Nations."

"The United Nations is a major part of our foreign policy. Accordingly, we are going to stay in it and stay with it. Therefore, we should use our position of world leadership and our genius for organization to improve its effectiveness and to adapt it to a changed world climate," Mr. Hotchkiss said.

California Public Utilities Commissioner Verne Scoggins spoke on "Utility Growth in California." Summarizing some of the great changes and the broad problems which are facing California utilities, he said: "There are more telephones in use in California today than there were people in California 30 years ago. . . . There has been more money invested in public utility properties in California during the past eight years than during all the previous history of our state. He continued:

"The theory of regulation which grants a degree of monopoly, carries with it the compulsion to endeavor to render service in keeping with demand. We have had instances in California where single utility companies during recent years have had to finance and install service facilities equivalent to the total needs of entire states in our nation. . . . Since July 1945, California utility companies in their effort to keep pace with the state's needs, have marketed almost 3.5 billion dollars in new securities. We have been told that these same companies will add another 500 million dollars to their financing programs this year. Over 90 per cent of this tremendous sum which amounts to more than $290 for every resident in the state, has gone for new financing for gas, electric, telephone, and water companies. . . .

"We at the commission are fully aware that all this construction and expenditure of postwar dollars—all this building during a period of inflation—constitutes a difficult hurdle in the path to rate stability. As a matter of fact, the average investment per customer of some of our utilities is likely to continue to rise for several more years. . . .

"In all modesty, I think the commission can lay claim to having been helpful in creating an atmosphere which has encouraged the successful marketing of the securities required for this great development. . . . The new money had to come from investors, large and small, institutional and individual. The California commission has worked diligently to keep such investors aware of where they stand and it will continue to insist on the filing of complete company reports from which investors can draw reasonable conclusions as to the soundness of their investment."

Concerning rate revisions, Commissioner Scoggins said:

"The commission has found on many occasions of late that the rule of reasonableness called for rate revisions. The increases have been allowed chiefly in recognition of increased costs of operation—cost factors which all of us know have soared during recent years. In its decisions the commission has placed its reliance upon the great emphasis given the phrase 'reasonable return' by the supreme courts of both the state and nation. Within this so-called zone of reasonableness the commission must always strive to fulfill its obligations to management, to consumers and ratepayers, to investors and to the general public. To discharge this responsibility objectively and efficiently in these changing times is no small task. It is a continuous challenge that requires the loyal and sincere application of the talents of many specialists in the various phases of utility operation. It's a job that has to be worked at daily."

The afternoon sessions of the first day were devoted to four panel discussion groups dealing with commercial, traffic, plant and revenue accounting operations and methods.

Discussing commercial operations, Hal O. Davis of the Los Gatos Telephone Co. was assisted by R. C. Ferber of California Interstate Telephone Co.; C. D. Hutton of Pacific Telephone & Telegraph Co.; R. M. Crockett of Citizens Utilities Co., and Paul F. Sercu of General of California.

Owen G. Jarboe of General of California led the traffic round table. Others participating were Mrs. Ann Peterson of Gilroy Telephone Co.; L. A. Dudley of California Water & Telephone Co.; R. L. Edmonds of The Pacific Telephone & Telegraph Co., and Mrs. Naomi Loux of California-Pacific Utilities Co.

Leader of the plant methods and records forum was Donald H. Strahl of Gilroy Telephone Co., with M. H. Alexander of Kern Mutual Telephone Co.; O. E. Emley of Sunland-Tujunga Telephone Co.; E. J. Morrison of California Interstate Telephone Co.; W. Gilman Snyder of Western Telephone Co., and Jack Williams of California Water & Telephone Co.

The revenue accounting forum was led by J. P. Maguire of Kern Mutual Telephone Co., assisted by H. C. Corke of The Pacific Telephone & Telegraph Co.; Richard Crowe of Dos Palos Telephone Co.; J. Curtis Newman of Coachella Valley Home Telephone Co., and Allen R. Stacey of Sunland-Tujunga Telephone Co.

On the morning of the second day, a report by Lyndon Farwell, president of

Los Gatos Telephone Co., disclosed that Willard G. Wade had been elected president of the association to succeed C. F. Mason. Mr. Wade is executive vice president of California Interstate Telephone Co., and has 30 years with the telephone industry. New vice presidents announced were Richard D. Crowe, manager of the Dos Palos Telephone Co., and Fred H. MacGougan, division manager of California Water & Telephone Co. at Monrovia. Frank V. Rhodes was re-elected secretary-treasurer. New directors are J. P. Maguire and Donald H. Strahl. Other directors are Mr. Mason, Fred H. MacGougan, Mr. Crowe, Mr. Wade and J. Curtis Newman.

Bringing "Greetings from the United States Independent Telephone Association," president of that organization, Warren B. Clay, of the Independent telephone industry said, "Our business is made up of 5,200 individual companies, with a plant investment of over 1.6 billion dollars and gross annual revenues of over 500 million dollars.

"Totally we serve 11,000 communities in a geographical area embracing two-thirds of the nation. We employ more than 100,000 persons, have more than 150,000 stockholders and serve more than nine million telephones," Mr. Clay stated. He continued:

"This is big business. But it's big business founded on thousands of small businesses, each doing its job with enthusiasm and devotion—each providing a separate link in the over-all system that has given our American people the finest telephone service in the world.

"The future of the Independent telephone industry was never so bright. Opportunities and almost unlimited horizons for growth and expansion are still there for those who wish to seek them in the true American fashion.

"Opportunities for private financing of telephone expansion—once considered extremely limited—are opening to a greater degree each year.

"Public utility commissions are recognizing our need for increased revenues to meet our rising costs, and to establish our business on a more solid financial foundation, so that we can attract the necessary improvement funds.

"We have the continuing problem of telephone income — and the constant problem of convincing both the public regulatory bodies and our subscribers that telephone income must remain at a high level if our standard of progress is to continue.

"We have a lot to sell—and the leveling off of our national economy means that we now have to start selling in earnest.

"We have to sell our long distance service. We have to sell people on greater use of extensions. We have to convince our right-of-way companies, such as the electrical companies, the oil line companies and others, that their communications systems should be

1947-1954

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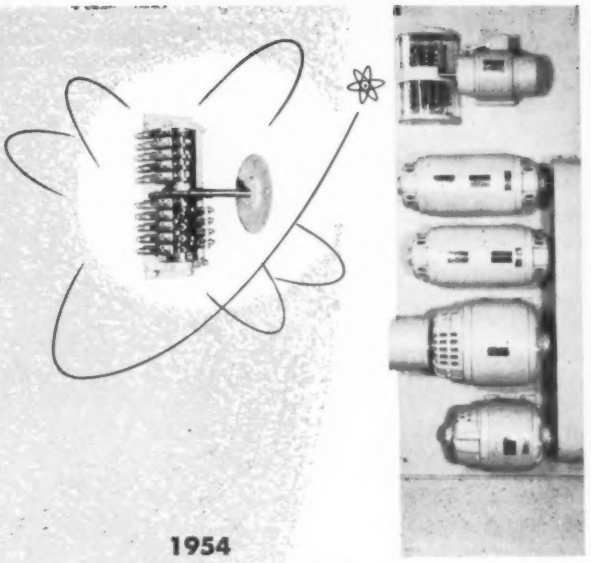
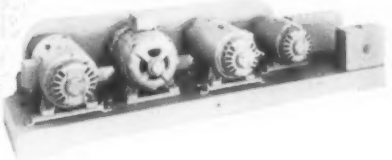


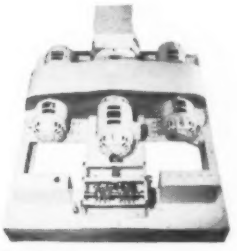
1954

Mar Vista, California. All connections at terminal board. Lubricated-for-life ball bearings throughout. Rugged, dependable construction. Equipped with coin controls — PLUS — A new and improved interrupter design. The pile-up is equipped with positive micro setting control of finger positioning. Another exclusive with ESCO



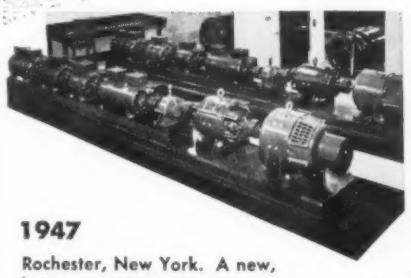
1951

Clarinda, Iowa. Simplified hook-up



1949

Oxnard, California. Improved interrupter design



1947

Rochester, New York. A new, better motor generator set

MOTORS ★
GENERATORS ★
CONVERTORS ★
DYNAMOTORS ★
GENERATOR SETS ★

ELECTRIC SPECIALTY CO.
176 SOUTH STREET, STAMFORD, CONN.

Specify ESCO when ordering ringing equipment.

maintained and operated by the telephone industry.

"Our goal must be the finest telephone service for *all* our citizens."

Following reports by the Pacific Coast Settlements Committee, the Dial Service and Advertising Committee and the USITA Small Company Pacific Regional Committee, presented by chairmen Willard G. Wade, Allen R. Stacey and D. O. Hood, general manager of the California-Oregon Telephone Co., respectively, the concluding address was given by Ben S. Gilmer, vice president of The Pacific Telephone & Telegraph Co.

Speaking on "Where Does the Future Begin," Gilmer said: "Tomorrow's telephone business is being fashioned today and if we, as managers of the business, do not give the right thought to tomorrow and tomorrow's tomorrow, we and our successors will not be able to take pride in the business tomorrow which we do today.

"So, we may very well ask ourselves where does the future begin and of course it begins all around us, today, yesterday and the day before. But all we can do to control it is what we do today—what we do to adapt ourselves and our industry to the changes now taking place—to the developments now under way."

He continued:

"All these things (new developments) are under way now or being planned by level-headed professionals. The point is that the future is rushing toward us at a terrific rate. And the shape of that future is desperately important to our business.

"On the economic side, income levels in this country—real income, I mean—appear to be permanently up to a new high standard for a huge segment of our population. This has profoundly affected the demand for our service.

"Or take the sustained trend toward suburban living, the increased mechanization of farms, the decentralization of industry. Every one of these things has affected our plant, our calling volume and our costs.

"Morton Hunt in his recent *Fortune* article, put it this way—'A telephone . . . is but one set of controls on a single electric machine that lies spread across the three million square miles of the U. S.'

"That is quite a concept. And as we become more and more tightly linked by automatic equipment the proper planning and handling of this machine will demand all the skill and foresight we can scrape up.

"The future is never far away — changes come shockingly fast these days. Everything you do today affects your business future."

IN THE NATION'S CAPITAL

Continued from page 14

House a measure calling for the creation of a new advisory board to be known as the "Commission on International Telecommunications." The technical name of this bill was Senate Joint Resolution 96; and it had already passed the Senate a year ago. The President's approval was assured.

The primary purpose is to provide for the study of various media and mechanics for international communications for the different federal intelligence and propaganda services. The new group would scrutinize, among other things, the possible use of a transatlantic television system by the Voice of America.

The telephone, telegraph, and cable industries have been following the progress of this resolution with interest because it also envisions the use of microwave facilities which could penetrate beyond international borders (specifically the Iron Curtain) for propaganda purposes of the Western alliance nations. Implicit in this, of course, is the possibility of government operation in a quasi-business field. Of course, the bill passed on July 19 does not provide for any system *operations* by the government, or by anybody else. It just establishes a study commission to report to Congress on the advisability of doing certain things. It is one of those generally commendable ventures which have to be watched to see that they do not stray from the constitutional path of proper government functions.

The new commission will be composed of nine members, five appointed by the President, and two each by the House and Senate. The commission post will be a part-time job, without compensation above expenses; but there is provision for some full-time staff assistance. Skipping the technicalities, the following quoted passage from the resolution stakes out the actual purpose of the measure:

"Without limiting the general scope of this direction, the work of the commission shall include consideration of, and report on, the following matters:

"(1) Present status of the use of the international air-waves in the information programs of this country and other nations of the world.

"(2) Present status of the use of television in the information programs of this country and other nations of the world.

"(3) Possibilities of the expanded use of television in carrying out the purposes of Public Law 402 (providing for the Voice of America).

"(4) Possibilities of international cooperation, both governmental and pri-

Streamlined production techniques, OCT-O-DUCT conduit add up to . . .

More Trench Feet per Shift in New 30-Mile Underground System

Thirty miles of 4-way and 6-way underground conduit in a single stretch south of San Jose, Calif., may be a record in itself. But contractors on the job agree that plenty of duct erection records were set. One crew laid 1600 trench-feet of 4-way duct structure in one working day —with only a regular 3-man erection team.

Well conceived specification by the utility, good planning by the contractors involved, and superior features of the new OCT-O-DUCT combined to make this record installation. The field-engineered features of the new flat-sided conduit proved out in this system which involved over 700,000 feet of duct.

If you are not using OCT-O-DUCT on your underground duct jobs you may not be getting the best circuit protection your money can buy.

New Installation Manual

A brand new OCT-O-DUCT Installation Manual is available for the asking. This incorporates much of the experience on the 30-mile system described here, plus the best of the know-how of electric and telephone utilities, municipal and industrial users of Soapstone conduits over the past quarter-century. Send for a copy today. Write:

SOAPSTONE DUCT COMPANY

110 Linfield Drive, Menlo Park, California

vate, in the construction, maintenance and operation of facilities to link the free nations of the world in an effective international telecommunications' (including television) network."

More light on the actual purpose of S. J. Res. 96 was shed by the report to the Senate on the measure by Senator Hickenlooper (R., Iowa) on behalf of the Senate Foreign Relations Committee. Senator Hickenlooper said, in the course of his report:

"The United States has spearheaded the technical development of television. Other countries are seeking our advice and guidance in developing their own television networks.

"If there is a default of our leadership in this field, television will develop haphazardly among the free nations, thereby making increasingly difficult, if not impossible in a technical sense, the ultimate linking of these nations through this new and vital means of communication. Initiative on our part now, on the other hand, will not only encourage a rational development of international television but it will probably insure a place for United States information telecasts on the networks of other countries as they come more fully into operation.

"There is a need to move promptly in this field. The U.S.S.R. has already established uniform telecasting standards among the countries of the Soviet bloc and is reported to be planning the installation of transmitters capable of delivering television signals to many free nations.

"The immediate requirement is for a thorough study of the developments to date in international telecommunications and for an exploration of the problems and prospects of establishing international cooperation in this field.

"Such a study and exploration is essential if we are to design national policies which will safeguard and advance the interests of the United States both in the peacetime and emergency use of this instrument of international contact."

V V

W. Va. Company Changes Name

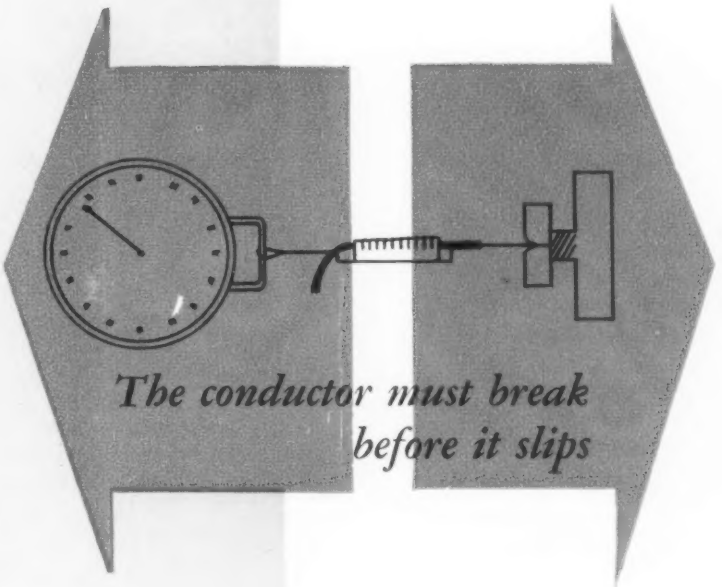
It was recently reported that at the annual meeting of the stockholders of the Bluefield (W. Va.) Telephone Co., one of the actions taken was a change in the company's name, effective July 1, to The General Telephone Co. of the Southeast.

STEPS TO FREEDOM

"The one result the Welfare state never achieves is welfare. It gives people more dollars to handle by making each dollar worth less and less. Dismantling the Welfare state is the essential step to true welfare for the people, as it is the essential step in preserving our liberty." — WILLIAM E. JENNER, *U. S. Senator from Indiana.*

ALPHADUCT

P clamp adhesion test



The conductor must break before it slips

P clamps are the most widely used method of attaching drop wire to buildings. Lest you may worry about a P clamp causing slipping of the insulation or jacket on Alphaduct Neoprene Jacketed Drop Wire — read about this Alphaduct service test. This test is made daily.

A sample of Alphaduct wire is inserted in a P clamp with 12 inches of the wire projecting from the top of the clamp. The bail of the clamp is then inserted in the upper jaws of a tensile testing machine, and the end of the wire is stripped free of jacket and insulation and inserted in the other end of the machine.

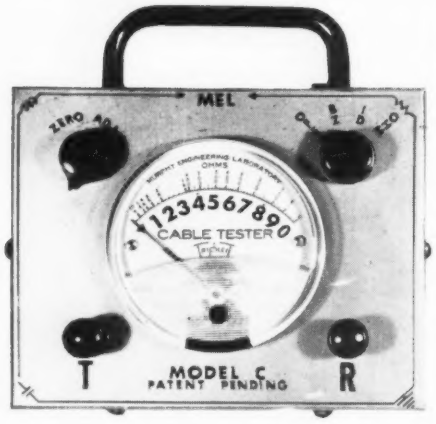
The jaws of the machine are then gradually separated until the conductor breaks. The conductor must break before there is ANY slipping of either the jacket or the insulation.

Don't have any worries about a little old P clamp hurting ALPHADUCT drop wire. Try Alphaduct. It's dated by a color coded thread so you can see for yourself how long it lasts, how much money it saves.

ALPHADUCT WIRE AND CABLE COMPANY • MILLTOWN, NEW JERSEY
NATIONAL DISTRIBUTORS • LEICH SALES CORPORATION, CHICAGO, ILLINOIS
REGIONAL DISTRIBUTORS • PANKEY SUPPLY CO., CHARLOTTESVILLE, VA.
THE LINDSAY TELEPHONE SUPPLY CO., CLEVELAND, OHIO

NEW . . . and Different!

The MURPHY (One-man) CABLE TESTER



Here is a tester that enables one man to do his own identifying of pairs, a job that heretofore has always demanded the use of two men.

A terminal board (not shown here but part of the tester) with resistance network is connected to the distant end of the cable in which pairs are to be identified and tagged. Then, the milliammeter is adjusted to read zero and compensate for the resistance of the cable pair. When the circuit is closed over pair one, it reads 1, etc.

The terminal board is connected so that when the tip side of the pair is identified the meter reading indicates "tens" and the ringside "units." In this way, any size, non-working cable, group coded by 100's may be tagged by one man.

Operating companies achieve reductions of 75% in man-hours of cable splicing crews. Now possible for a cable splicer working alone to bridge in 8 terminals in a day's time (and still loaf 10 minutes of every hour.) Complete instructions go with each set. Write today!

MURPHY ENGINEERING LABORATORY

4419 Tulsa Ave., Houston 24, Texas

Lincoln (Neb.) T&T Celebrates 50th Service Anniversary

During the month of June, the Lincoln (Neb.) Telephone & Telegraph Co. (LT&T) celebrated its 50th anniversary of service to the people of southeast Nebraska.

From a humble beginning with a single exchange at Lincoln serving 1,800 telephones, LT&T has grown to become the largest Independent telephone company in Nebraska and one of the largest in the United States.

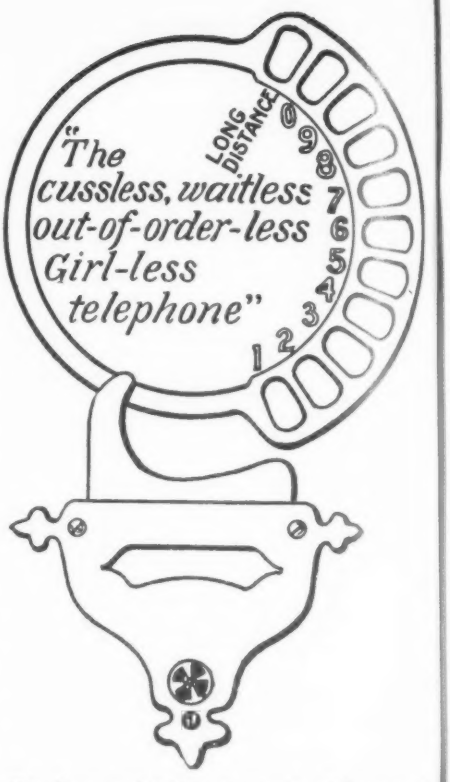
Today the company serves 115,000 telephones in some 200 communities of the southeastern 22 counties of the state. It owns all the toll lines in its operating territory and last year handled well over four million long distance calls. Local calls numbered many millions more.

The history of the company parallels the later five decades of the life of Frank H. Woods. Mr. Woods was the principal organizer of the company and served as president from 1905 to 1946 when he retired to become chairman of the board. He was succeeded as president by Thomas C. Woods, Sr., under whose leadership the company has continued its record of growth and progress.

Other principals in the organization and early operations of the company were Leonard E. Hurtz, general manager; C. P. Russell, auditor; Seth W. Eddy, secretary and assistant treasurer; Mark T. Caster, plant superintendent; R. E. Mattison, commercial superintendent; and George K. Gann, traffic superintendent.

When the company started there was a well established Bell company serving Lincoln and the two companies were in competition until 1912.

New telephone equipment building at Lincoln with its microwave radio antenna. This is the dial toll center for southeast Nebraska and also contains local dial switching equipment and Lincoln's long distance switchboard. Long range planning calls for the addition of five stories and a three-story wing. Total present investment in the new building is 3.5 million dollars.



This slogan and design of an early dial was used by the Lincoln company in early advertisements and also appeared on cover of its directories.

At that time, through the efforts of a committee of the United States Independent Telephone Association headed by Frank H. Woods, an agreement was reached with Bell interests throughout the United States for the elimination of competition and the furnishing of a unified national toll system. This saved many early telephone companies from bankruptcy and established the industry on a sound financial basis.

Mr. Woods saw the potentialities of dial service and in spite of doubt and ridicule from many industry leaders he installed a dial system at Lincoln in 1904, the first successful dial installation in Nebraska. His good judgment is proven by the universal use of dial service today for both local and long distance service.

Other advancements were brought about under Mr. Wood's leadership. He was intensely proud of the part this company and other Independent companies played in bringing telephone service to smaller communities and rural areas, and he did much to bring about the establishment of commissions to regulate utility rates and service. Under his guidance the company adopted one of the first employe disability and pension plans in Nebraska.

Mr. Woods' death on Apr. 1, 1952, brought to a close a long and brilliant career which earned him national reputation not only in the telephone busi-

ness but also as an astute financier and lawyer.

The year 1912 saw the beginning of the growth of the company to its present operating area. The Lincoln properties of the competing Bell company were purchased and other properties south of the Platte River were acquired. By 1915 the company was operating 92 exchanges and serving 46,000 telephones, and the first transcontinental toll call was made.

The company continued to grow until 1929 when it was serving 83,500 telephones. Years of drouth and depression that followed curtailed both local and long distance service, and then came World War II with its enormous demands for telephone communications.

Under this stimulus long distance calls in 1943 passed the two million mark and in 1950 the company installed its 100,000th telephone. A program of dial conversion was started in 1930 and today 83 of the company's 125 exchanges and 73 per cent of its telephones are dial operated.

A notable event in 1941 was the laying of the transcontinental underground toll cable. A portion of the cable crosses the Lincoln company territory, thus giving it direct access to these long distance facilities. In 1946 mobile radio telephone service made its bow in Lincoln, the first time such service had been provided in the United States by an Independent telephone company

Long distance operator dialing was inaugurated at Hastings in 1950, but it was available to only a limited number of exchanges in this area. Two years later the first connection with the national toll dialing system was made at eight exchanges, and last year company-wide connection with this system was completed.

The company's first installation of microwave radio relay service has just been completed. This involved the construction of two antenna towers, one at Gretna and one at Lincoln, for the reception of micro-wave radio from Omaha. This will bring network television service to KOLN-TV at Lincoln and later may be used to provide facilities for long distance and other services.

V V

"Lift the flaps of your own mental tent and scan the horizon beyond the limits of physical sight and across the boundaries of prejudice and ignorance. You are the one who can stretch your own horizon; you are the person responsible if that horizon is small."—EDGAR F. MAGNIN.

Fold up your derrick from inside the cab!

with the

TEL-E-LECT STORAGE KIT

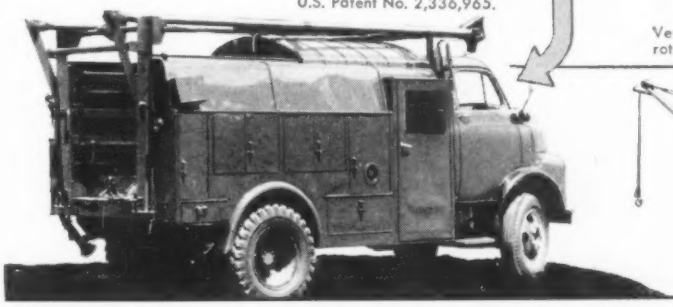
The patented Storage Kit fits any standard utility truck body and "A" frame derrick and it can be quickly bolted on the back of your truck by your local mechanic. The derrick will go up or down in a minute or less, entirely controlled by the man in the truck cab. Working with a double drum winch, you get live boom operation—or easily adjustable derrick elevation with a single drum winch. The cost is only a fraction of other, more intricate derrick storing systems—and there's no rebuilding of your present equipment! *Write for details.*

Earth Boring Equipment for All Types of Trucks

TEL-E-LECT PRODUCTS, INC.

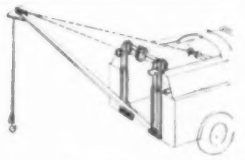
10,001 Minnetonka Blvd., Minneapolis 16, Minn.

U.S. Patent No. 2,336,965.



Derrick raised by simply engaging the winch.

Vertical position—winch rotation reversed.



Derrick is locked in operating position.

GENERAL MACHINE PRODUCTS COMPANY, INC.
7th & Wood Sts.
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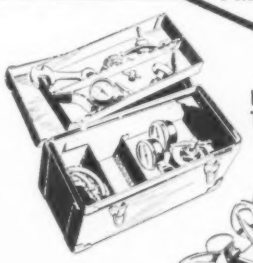
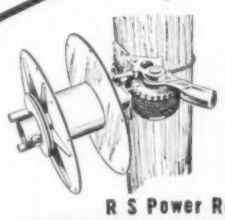
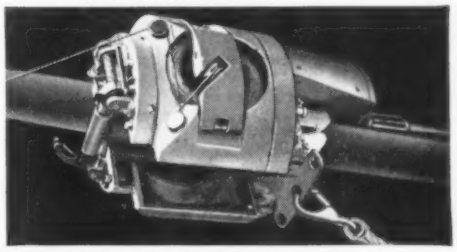
- Aerial Tents
- Cable Benders
- Cable Blocks
- Cable Lashers
- Coaxial Cable Tools
- Lashing Wire Clamps and Grips
- Portable & Power Reels



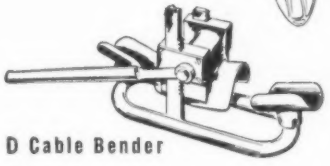
Pressure Testing Kit



R S Power Reel



C R Power Reel



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Over 250 various items of Line Construction Tools, Maintenance & Pressure-Testing Equipment in stock for immediate Shipment

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Locates Line Trouble Fast

LINEMAN'S TEST SET ..... (Model H)
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Type S-1-A
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We are as proud of this tag

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NOW SHIPPING!
$1180. per Channel

McELROY
MANUFACTURING CORP.
Littleton, Massachusetts, U.S.A.

Reilly Opens New Office in Houston

Announcement has just been made of a new Houston sales office for the Reilly Tar & Chemical Corp. by J. H. Barnett Jr., general sales manager of the company. Located in the Green Building—Suite 11, 2009 Fannin St., Houston 2, Tex., this office will be supervised by Donald Becker.

Reilly Tar & Chemical Corp.'s new office, now one of three in Texas alone, is equipped to handle the sale of coal tar enamels, chemicals, creosoting materials, road tars, roofing, waterproofing, and other Reilly products.

V V

Child of Stromberg Veteran Gets First Stock from "Big Board"

Little 11-months-old Ann Christine Larson, daughter and granddaughter of a veteran Stromberg-Carlson family, became the first purchaser of that company's common stock when it was listed on the New York Stock Exchange on July 6.

The first share was presented to Ann Christine by her grandfather, C. Robert Larson, oldest living employe of the company. He entered the employ of the Stromberg-Carlson Company in 1899, and is now retired.

Previously Stromberg-Carlson stock was traded over the counter. It is designated as SCA on the "Big Board." Mr. Larson paid 38⅞ for the first share.

Also happily participating in the ceremony when this share of stock was presented to Ann Christine, in the offices of George D. B. Bonbright & Co., Rochester brokers, were the little girl's parents, Mr. and Mrs. Harold Larson. Harold, son of the elder Mr. Larson, is a tool and gauge engineer, and has been with Stromberg-Carlson for 19 years. Mrs. Larson also formerly was employed in the company's personnel department.

The elder Mr. Larson recalled that he had purchased his first 10 shares of the company's stock for $13 a share, in 1914, and that since that time he has received eight shares for each one originally held.

V V

John Clemens Named Kellogg's Assistant Comptroller

John Clemens has been appointed assistant comptroller of Kellogg Switchboard & Supply Co., division of International Telephone & Telegraph Corp., S. H. Bass, comptroller, recently announced.

Mr. Clemens, who took over his new position on July 15, was associated for 11 years with George Rossitter and Co., certified public accountants, Chicago, prior to joining the Kellogg company.

V V

"It is a happy thing for us that this is really all we have to concern ourselves about—what to do next. No man can do the second thing. He can do the first."—GEORGE MACDONALD.

Little ANN CHRISTINE LARSON, in the arms of her father, HAROLD LARSON, makes sure she gets her share—of Stromberg-Carlson common stock. It was presented to her by her grandfather, C. ROBERT LARSON (right).

Kellogg Appoints Langston District Manager in Portland

L. B. Langston has been named district manager for the Kellogg Switchboard & Supply Co. in Portland, Ore., according to an announcement by O. C. Bailey, assistant sales manager.

Mr. Langston, who has been active in the telephone field since 1921, moves to his new assignment from a Kellogg post in Kansas City, Mo. He has been associated with Kellogg for 27 years, serving with the switchboard sales department in Chicago, and as district manager in St. Paul, Minn., in addition to his Kansas City experience.

L. B. LANGSTON

Before joining the Kellogg organization he was, for six years, central office maintenance and wire chief for the Missouri Union Telephone Co. in Clinton, Mo.

V V

Koppers Announces Changes In Wood Preserving Group

Twelve promotions and appointments reflecting the expansion of the wood preserving activities of Koppers Co., Inc., following its purchase of American Lumber & Treating Co., were announced on June 18 by Walter P. Arnold, vice president and general manager of the company's Wood Preserving Division.

Several appointments incorporate top personnel of American Lumber & Treating into the management structure of the Wood Preserving Division.

With the recent acquisition, Koppers obtained ten wood treating plants in nine states, three of which are on the West Coast, as well as patent rights to several valuable salt treatments, including Wolman treatment, the world's most widely used salt preservative for wood.

Appointment of two assistant vice presidents of the Wood Preserving Division, Douglas Grymes, Jr., and Paul Wayman, was announced by Mr. Arnold. Mr. Grymes will continue to serve as sales manager of the Wood Preserving Division. Mr. Wayman, a former vice president of the American Lumber & Treating Co., will become assistant manager of the division's eastern region.

D. A. Mitchell, who has been assistant to the vice president and general manager of the division, has been named manager of the newly-formed Pacific district incorporating the Wilmington, Cal.; Wauna, Ore.; and Everett, Wash., plants, and sales offices at San Francisco and Los Angeles, Cal.; Portland, Ore.; and Seattle, Wash.

Mr. Mitchell will be joined by J. R. Cooper as procurement manager of the new Pacific district.

Among the several sales management appointments announced by Mr. Arnold is that of R. B. Putman, former sales manager of American Lumber & Treating, as manager of the newly-created Wolman preservative department of the Wood Preserving Division.

Both R. H. Devine and D. C. Smith have been named assistant sales managers of the division. Mr. Devine for-

"...and you KNOW maintenance will be low!"

General Cable PAPER-INSULATED CABLE

GENERAL CABLE GENERAL CABLE GENERAL CABLE

You don't take chances when you buy General Cable Paper-insulated Cable—the records prove it's as maintenance-free as cable can be! It's carefully made of high-conductivity wire, dry paper, and strong, antimony-lead sheathing, and is pressure-tested for 24 hours before shipping. Ask for prices now on all standard gauges and number of pairs.

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Highest Quality
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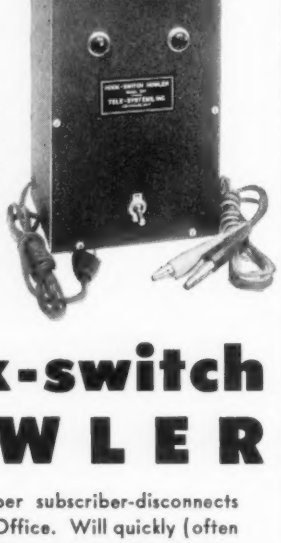
New!



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hook-switch HOWLER

Solves improper subscriber-disconnects from Central Office. Will quickly (often within a month) pay for itself. The line is automatically clear when subscriber hangs up. Uses standard telephone DC voltages. Simple to use. Portable. 10 year life.

Order one now—end your troubles.

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merly was assistant to the sales manager. Mr. Smith has been sales manager of the division's Pittsburgh district.

Succeeding Mr. Smith as sales manager of the Pittsburgh district is M. R. Clifton who has been sales manager of the Baltimore area.

New Baltimore area sales manager is C. D. Bird who has been district sales manager of the American Lumber & Treating Co.

L. A. Pisegna has been named sales manager of the Montgomery, Ala., area.

New assistant manager of the Finance department of the Wood Preserving Division is H. H. Humphreys, who formerly held the post of secretary-treasurer of the American Lumber & Treating Co.

D. E. Curtice, former general superintendent of the American Lumber & Treating Co., has been named assistant general superintendent of the operating department of the Wood Preserving Division.

Answers to Traffic Questions On Page 15

(1) Such calls may be recognized by (a) the wording of the mechanical answer if you are cut in on the connection, (b) statements by the calling party that a mechanical answer was received or an inquiry as to the meaning of such announcements, (c) a request to reestablish the connection because of inability on the first call to complete leaving a message, or (d) a claim that no satisfaction was received because of the mechanical answer.

(2) As soon as an automatic answering set connection has been identified, enter "AA" in capitals in the Special Instruction space.

(3) The subsequent attempt time should be determined in the regular way being governed by any information indicated by the announcement.

(4) Yes.

(5) Yes. If she knows or it develops that the claim is a result of receiving a mechanical answer, she will consider this the equivalent of an answer by a person qualified to give a message and explain the circumstances saying that there will be a charge for the call. She will offer to try a new call at a time convenient to the calling party and then will be guided by the response received.

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General Cable Names Barnes Assistant to President

Arthur Z. Barnes, southwestern district sales manager for General Cable Corp., has been elected assistant to the president it was announced by J. R. MacDonald, company president.

Mr. Barnes will have his headquarters in Dallas, Tex., and will also be

A. Z. BARNES

responsible for district sales offices in St. Louis, Kansas City, Memphis and New Orleans.

He first joined the General Cable company in 1929 as Dallas district sales manager. His entire career has been closely associated with electrical power, transmission and distribution for utilities, the construction industry, the railroads, the communication industry and many other users of electrical wire and cable.

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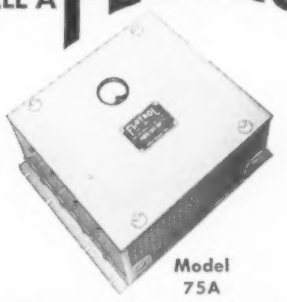

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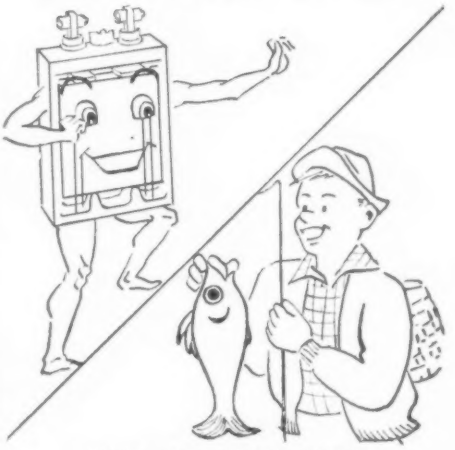

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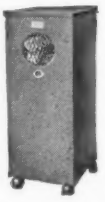

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